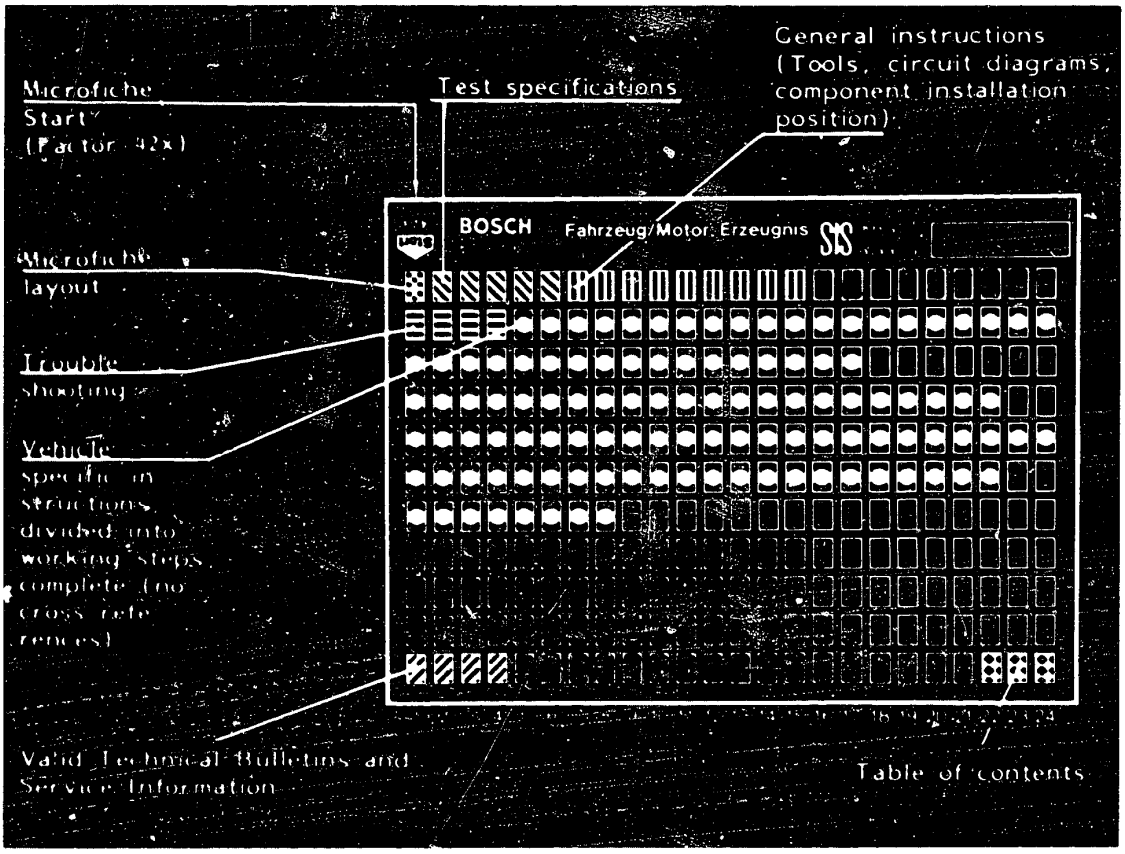
Microfiche layout



1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

1. Test specifications

1.1 Idle speed:	750 ± 30 min^{-1}	C9
1.2 Nozzle-opening pressure:	130 + 8 bar (100 D) 155 + 8 bar (100 D-Turbo)	C11
1.3 Filter test max. allowable differential pressure:	0.3 bar	C15
1.4 Compression loss:	max.allowable 25 %	D12
1.5 Injection timing: Engine position:	cylinder 1 at TDC	G1

Checking value

Pump position: 0.80...0.90 mm after BDC (AUDI 100 5 D)

Pump position: 0.88...0.98 mm after BDC (AUDI 100 5 D-Turbo)

Setting values

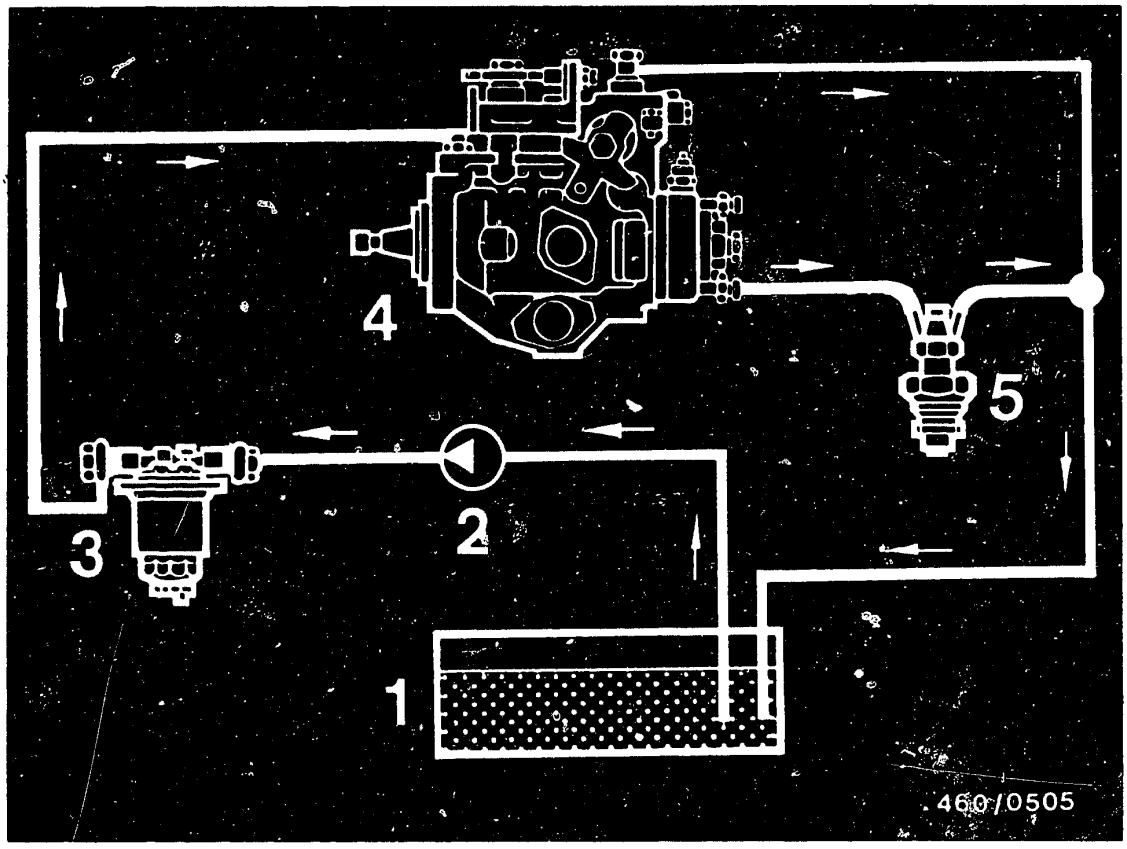
Pump position: 0.85±0.02 mm after BDC (AUDI 100 5 D)

Pump position: 0.93±0.02 mm after BDC (AUDI 100 5 D Turbo)

1.6 Charge-air pressure:	0.64...0.72 bar
1.7 Blow-off valve:	0.81 + 0.05 bar
1.8 Compression pressure:	28 ... 34 bar
max. difference between cylinders:	max. 5 bar

1.9 Tightening torques

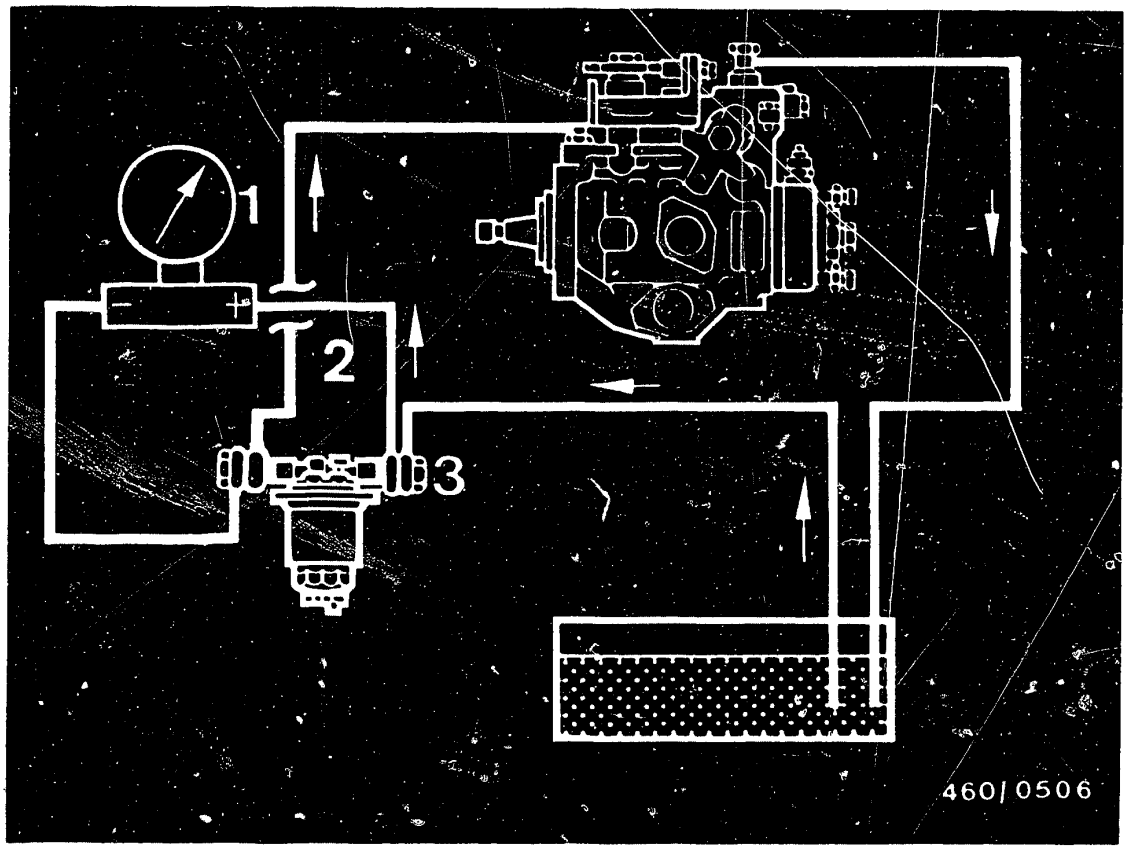
Fuel-injection pump gear	45 Nm
Fuel lines	25 Nm
Fuel-injection pump fastening screws	25 Nm
Camshaft gear	100 Nm
Screw plug	15 Nm
Nozzle-holder assembly fastening screws	70 Nm
Sheathed-element glow plugs	40 Nm
Camshaft drive gear (Hexagon screw)	45 Nm
Injection-pump support bracket (Fastening screws)	25 Nm
Injection-pump console	65 Nm
Fastening screws Turbocharger / exhaust manifold	60 Nm
Exhaust manifold / engine block	25 Nm
Exhaust pipe	40 Nm



1 = Fuel tank
2 = Fuel pre-supply pump (on export models only)
3 = Fuel filter
4 = Distributor-type fuel-injection pump
5 = Injection nozzles

2. Diagram of fuel lines

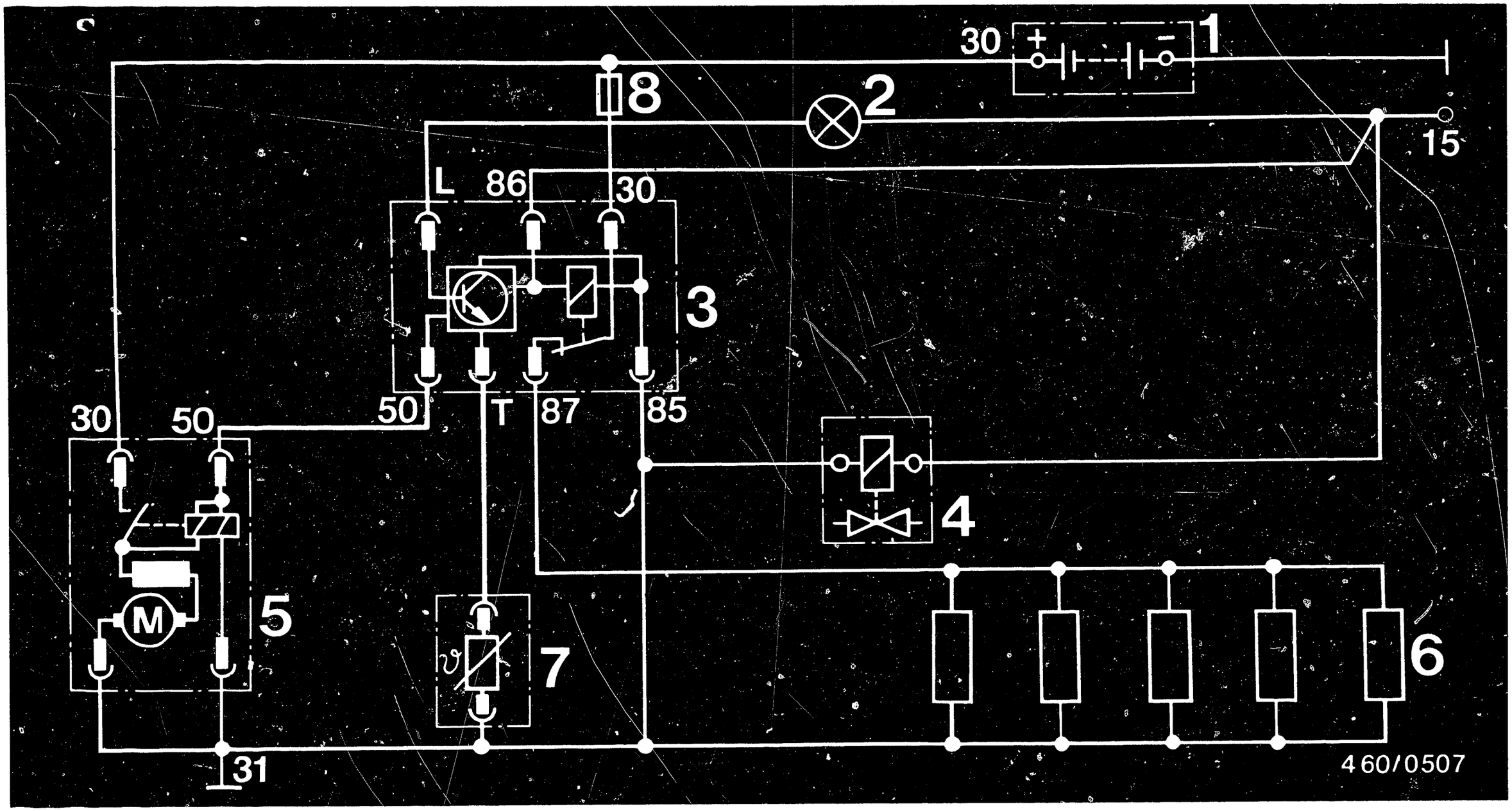
The fuel lines are connected as shown in the above diagram.
The fuel flows in the direction of the arrows.



1 = Differential-pressure gauge
2 = Filter outlet (use inlet union and extra-long inlet-union screw 2 443 456 020)
3 = Filter inlet (use inlet union and extra-long inlet-union screw 2 443 456 020)

2.1 Connection diagram for filter test

Connect differential-pressure gauge to fuel filter using appropriate connecting pieces.



1 = Battery
2 = Visual indicator
3 = Glow-duration unit
4 = Solenoid-operated valve
5 = Starting motor
6 = Sheathed-element glow plugs
7 = Temperature sensor
8 = Fuse 80 A

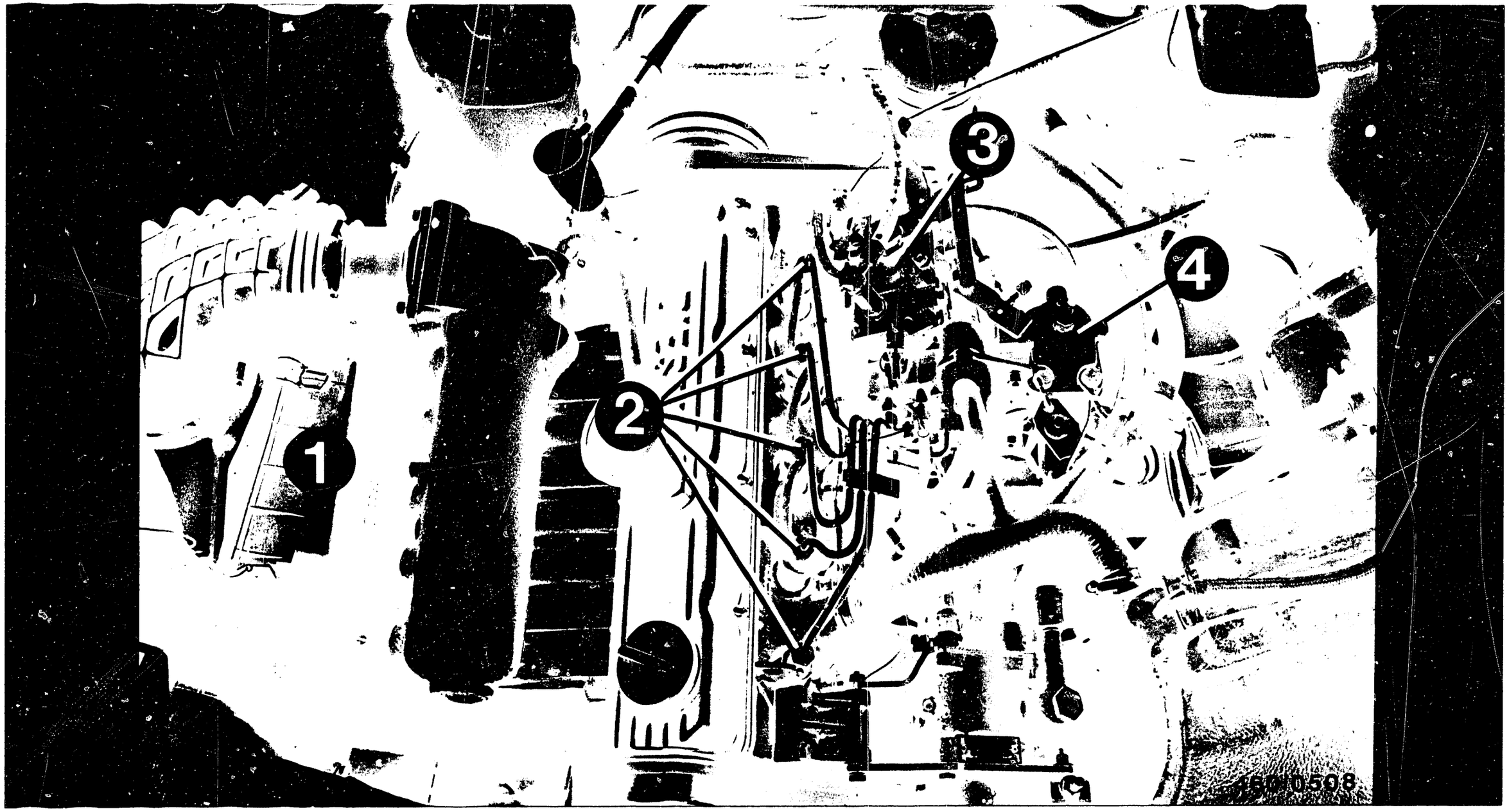
3. Terminal diagram for preheating system

4. Test equipment and tools

Designation	Part No.	Use
Puller	KDEP 1118	Removing injection-pump gear
Locating mandrel	KDEP 1122	Locking the injection-pump gear
Holder	KDEP 1116	For locking the camshaft gear
Toothed-belt tester	KDEP 1121	Testing tension of toothed belt
Setting rule	KDEP 1117	Locating the camshaft
Box wrench	KDEP 1115	Loosening fuel-injection tubing
Measuring tool	KDEP 1085	Injection timing
Mini dial indicator 1/100 mm divisions	Commercially available e.g. Hahn & Kolb 7000 Stuttgart Part No. 33 003 with adapter KDEP 1127	Injection timing
Pressure tester or pressure gauge 0 ... 1.6 bar	KDJE-P 100 e.g. Wika No. 4 184	Testing the charge-air pressure

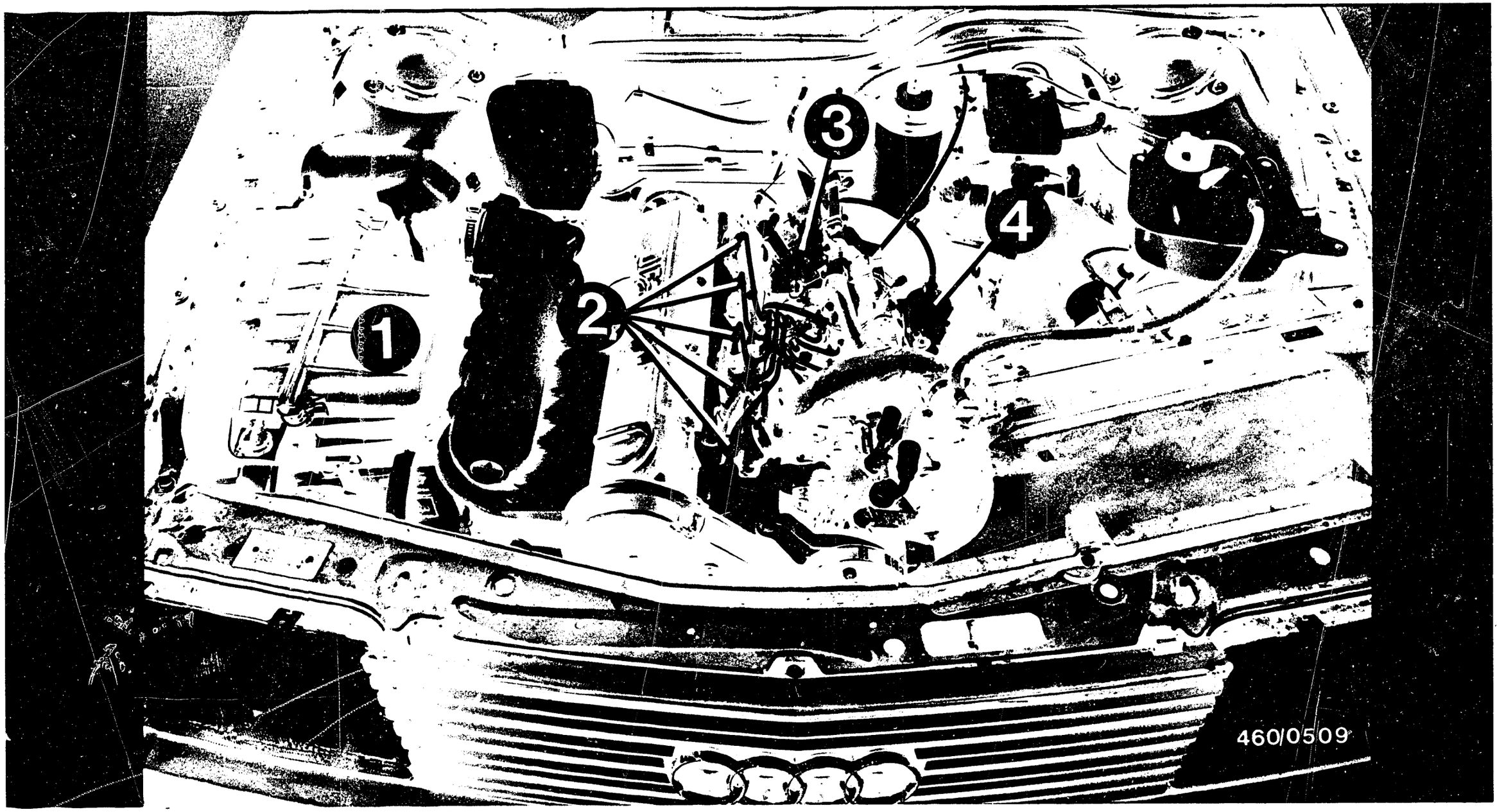
Test equipment and tools (continued)

Designation	Part No.	Use
Nozzle tester	EFEP 60 H 0 681 200 502	Testing the injection nozzles
Compression tester	Commercially available	Testing the engine compression
Compression-loss tester	EFAW 210 A 0 681 001 901	Testing the engine compression loss
Tachometer	Commercially available	Setting the engine speed
Differential-pressure guage	Commercially available Part No. NG 160/311-911/ - 1.0 + 4.0 bar Firma Henni Nauheimerstr. 78-80 7000 Stuttgart 50	Filter test
Smoke tester	0 681 169 039 0 681 169 038	Smoke test



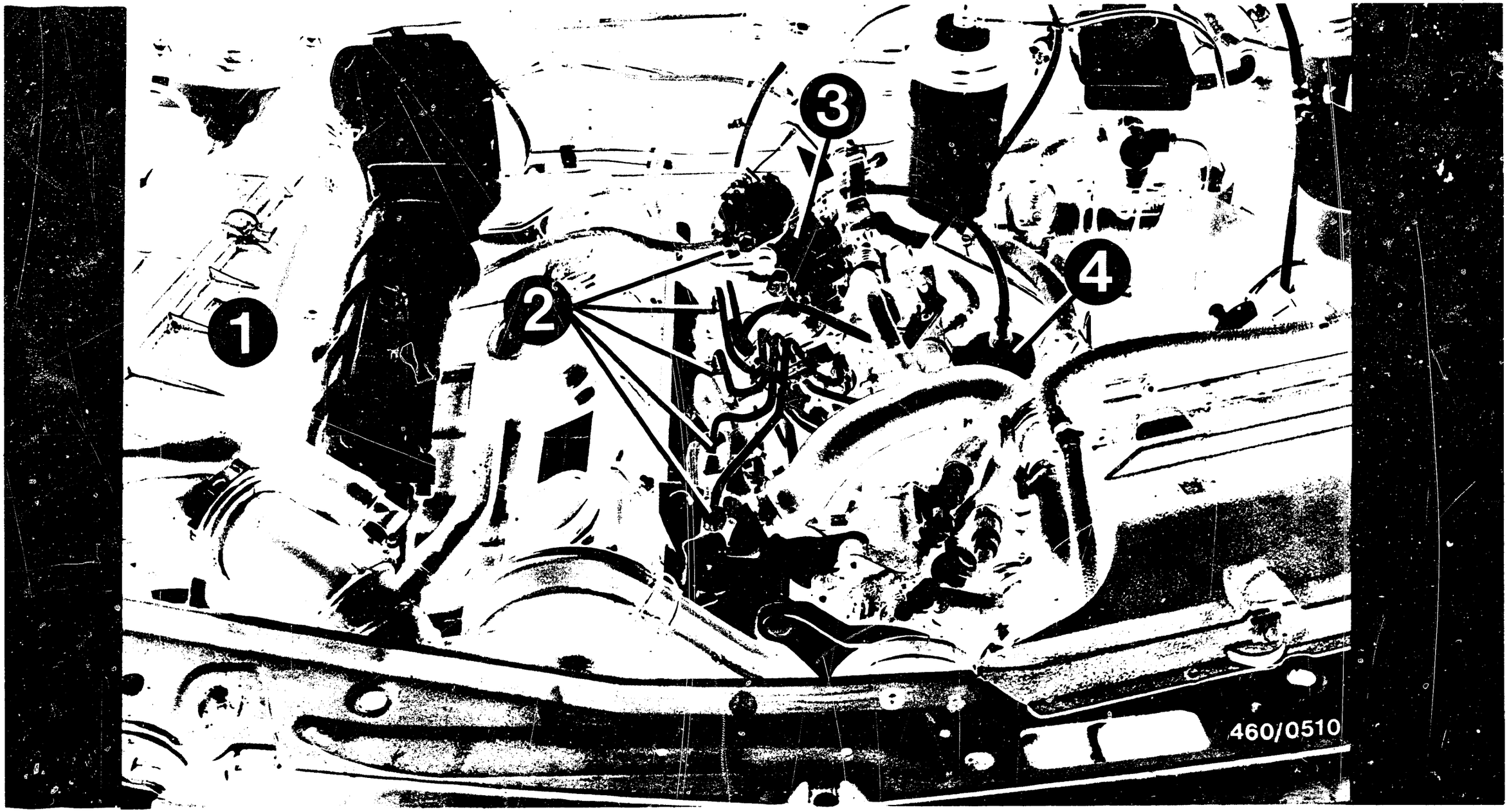
1 = Air filter 2 = Injection nozzles 3 = Injection pump 4 = Fuel filter

5. Installation position of components in Audi 100 5 D (8.78 – 8.82)



1 = Air filter 2 = Injection nozzles 3 = Injection pump 4 = Fuel filter

5.1 Installation position of components in Audi 100 5 D (9.82→)



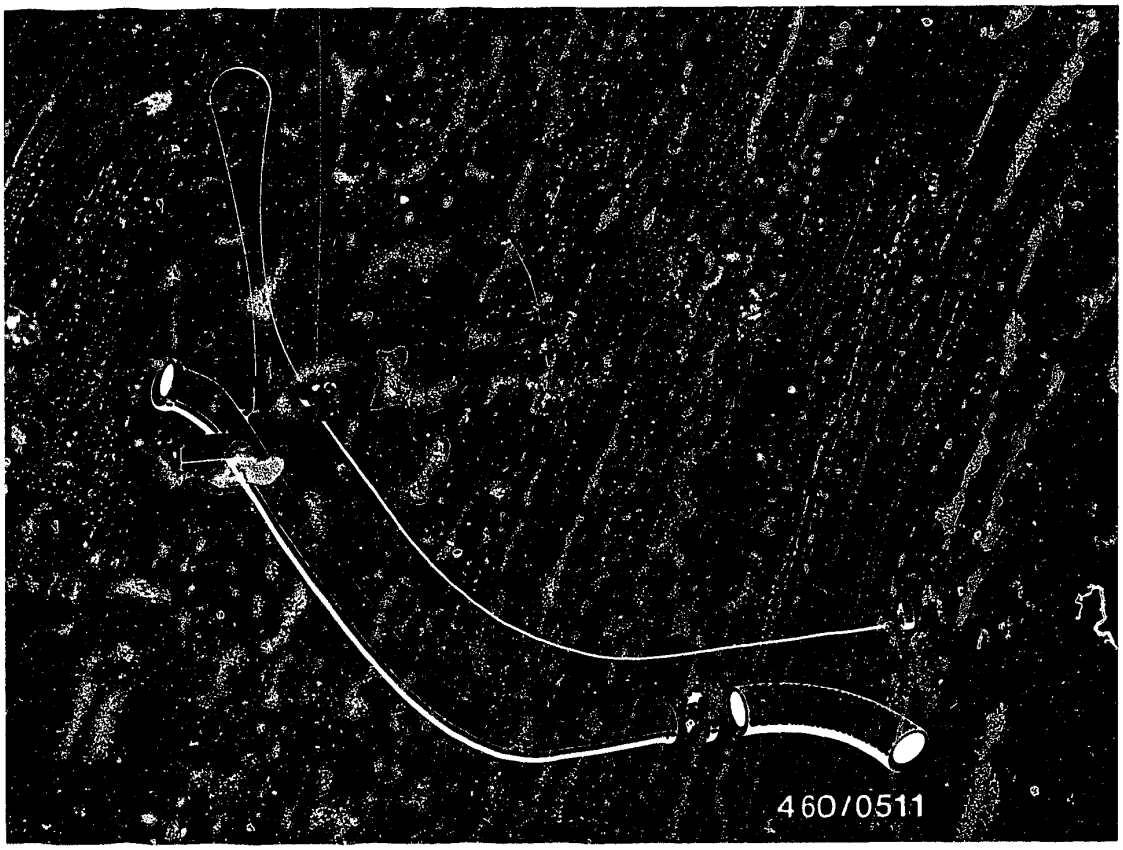
1 = Air filter 2 = Injection nozzles 3 = Injection pump 4 = Fuel filter

5.2 Installation position of components in Audi 100 5 D - Turbo (9.82→)

6. Trouble-shooting - Customer complaint (symptom)

1. Engine fails to start or starts only with great difficulty when warm.	2. Engine fails to start or starts only with great difficulty when cold.	3. Engine hunts when idling.	4. Erratic idling when engine is warm.	5. Engine misses during vehicle operation.	6. Unsatisfactory performance.	Cause (component fault)	Coordinate
●	●			●	●	Tank empty; tank vent clogged	B 5
	●					Cold-start accelerator not actuated	B 6
	●		●			Injection sequence does not correspond to firing sequence	B 7
				●		Overflow restriction clogged	B 9
●	●					Shutoff device defective	B 10
		●		●	●	Inlet-union screws of inlet and return lines clogged	B 15
●	●		●	●	●	Air in fuel system	B 16
	●					Heavy paraffin deposits in filter	B 19
●	●			●	●	Connections loose; lines leaky or broken	B 22
●	●			●	●	Supply lines clogged	B 24
●	●			●	●	Fuel-injection tubing clogged or constricted	B 24
					●	Engine air filter clogged	C 8
			●			Idle speed incorrect	C 9
●	●		●		●	Injection nozzle defective	C 11
	●		●		●	Start of pump delivery incorrect	G 1
●	●			●	●	Fuel filter clogged	C 15
	●					Pre-heating system defective	D 1
					●	Timing device defective	D 11
	●		●			Engine compression poor or uneven	D 12
					●	Maximum speed incorrectly adjusted	E 1
●	●	●	●	●	●	Fuel-injection pump (governor) defective or out of adjustment	E 1
					•	Test turbocharger for leaks and test charge-air pressure	C 8

7. Excessive fuel consumption.	8. Engine cannot be switched off.	9. Engine runs rough, black smoke in full-load range; possibly lack of power.	10. Fog-like smoke in full-load range (white).	11. Incorrect engine speeds.	12. Engine will not rev up when cold.	13. Distributor-type fuel-injection pump becomes too hot.	Cause (component fault)	Coordinate
			●		●		Tank empty; tank vent clogged	B 5
					●		Cold-start accelerator not actuated	B 6
		●		●	●		Injection sequence does not correspond to firing sequence	B 7
						●	Overflow restriction clogged	B 9
	●						Shutoff device defective	B 10
			●	●	●		Inlet-union screws of inlet and return lines clogged	B 15
			●		●		Air in fuel system	B 16
					●		Heavy paraffin deposits in filter	B 19
●							Connections loose; lines leaky or broken	B 22
			●		●		Supply lines clogged	B 24
			●		●		Fuel-injection tubing clogged or constricted	B 24
		●					Engine air filter clogged	C 8
				●			Idle speed incorrect	C 9
		●					Injection nozzle defective	C 11
●		●	●		●		Start of pump delivery incorrect	G 1
			●		●		Fuel filter clogged	C 15
		●	●				Timing device defective	D 11
●					●		Engine compression poor or uneven	D 12
				●			Maximum speed incorrectly adjusted	E 1
●	●	●	●	●	●	●	Fuel-injection pump (governor) defective or out of adjustment	E 1



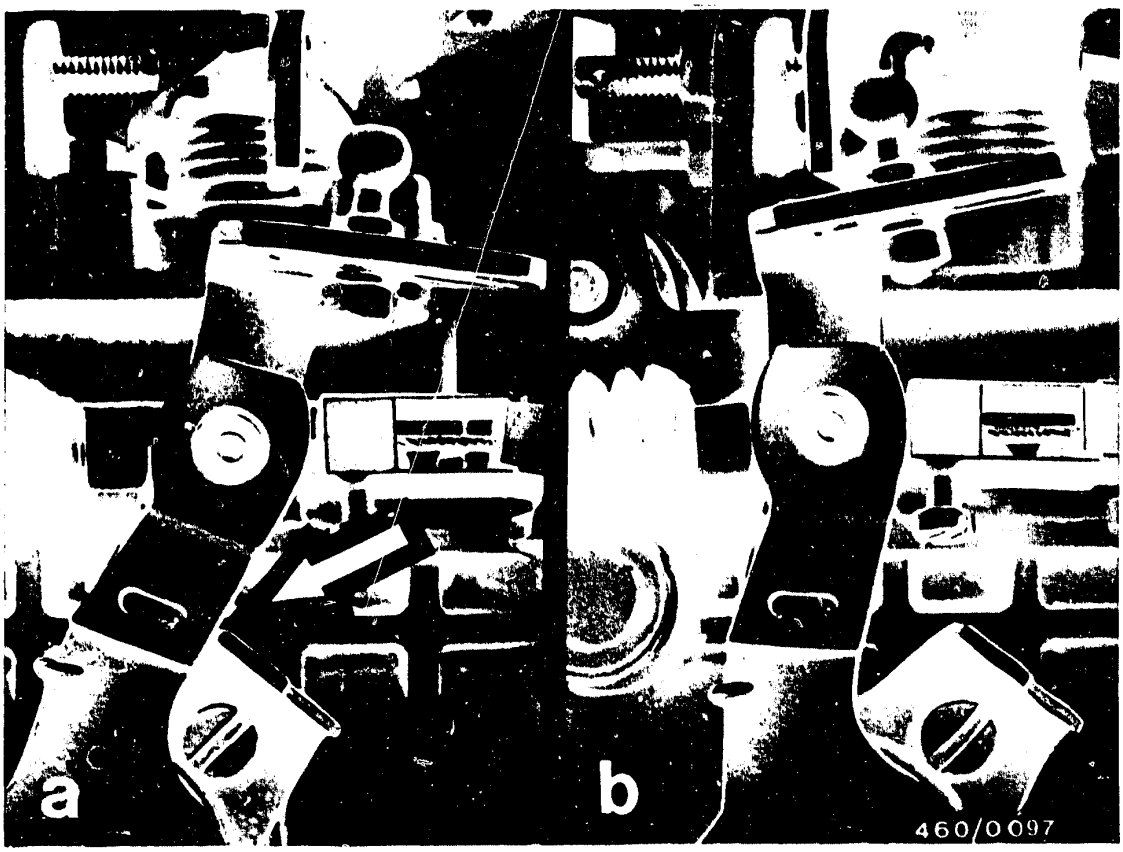
7. Check tank vent

Open tank filler cap.

If the fault disappears after opening the filler cap, the tank vent is defective.

Remove tank-vent hose lines (picture) and check for clogging or constriction.

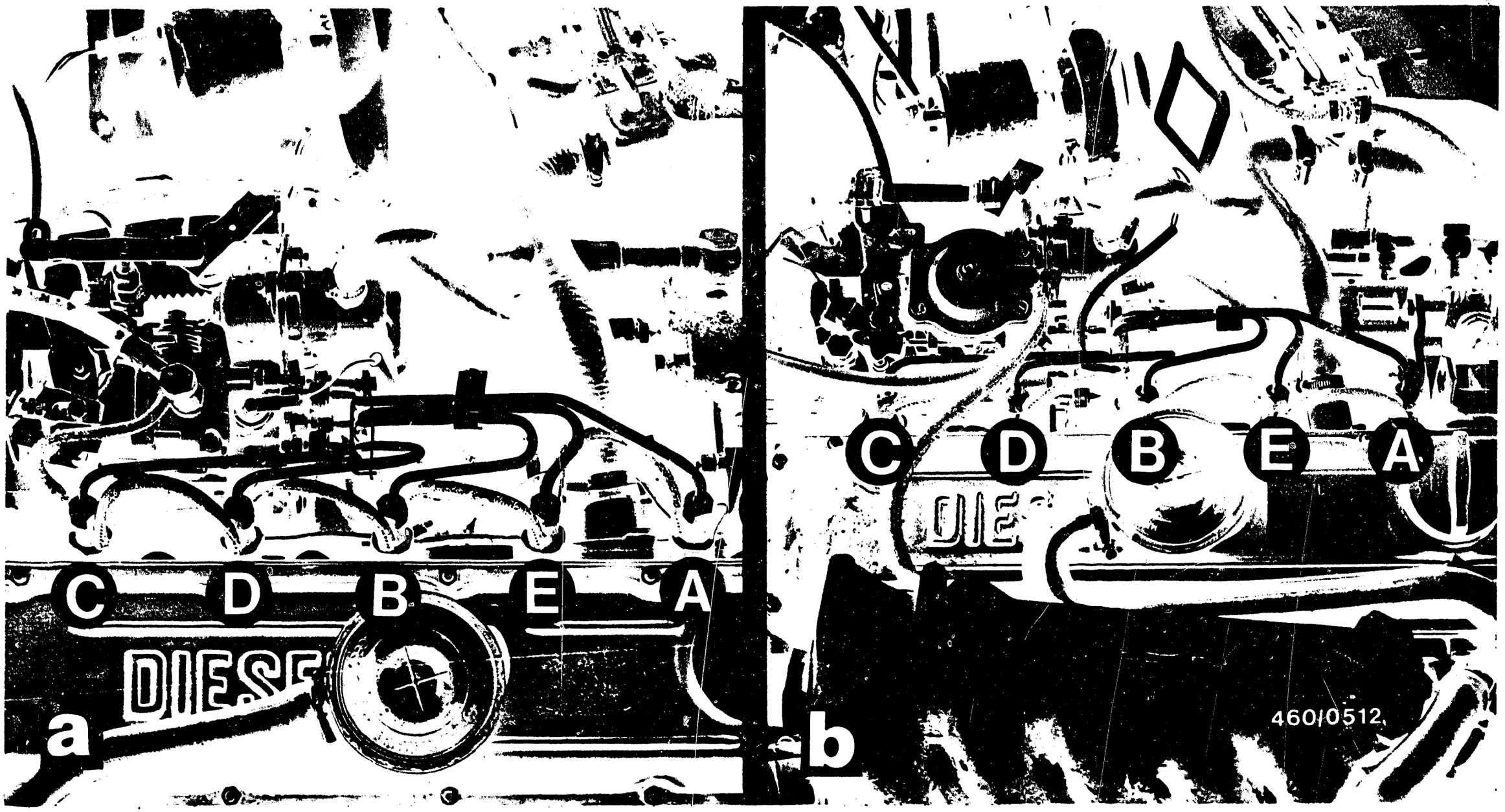
If necessary, check fitting on tank.



8. Test operation of temperature-controlled cold-start accelerator

If the cold-start accelerator is correctly set, with the engine at normal operating temperature (coolant temperature approx. 80°C) the control lever of the cold-start accelerator must be up against the stop bracket (picture a - arrow).

When the engine is cold, the control lever of the cold-start accelerator has reached its maximum working stroke (picture b).
If, when cold, the control lever remains up against the stop bracket or makes only a short stroke, it is necessary to remove and reset the injection pump.

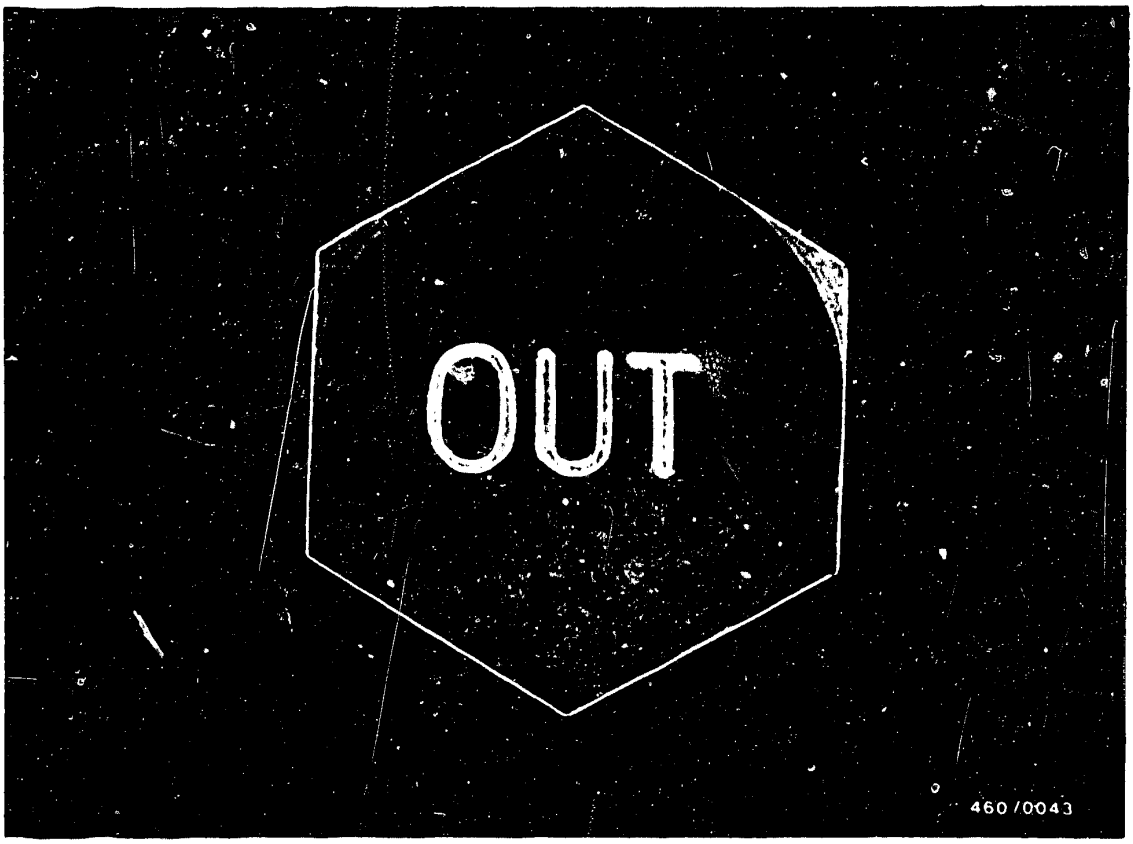


Picture a = AUDI 100 D

Picture b = AUDI 100 D - Turbo

9. Check routing of fuel-injection tubing

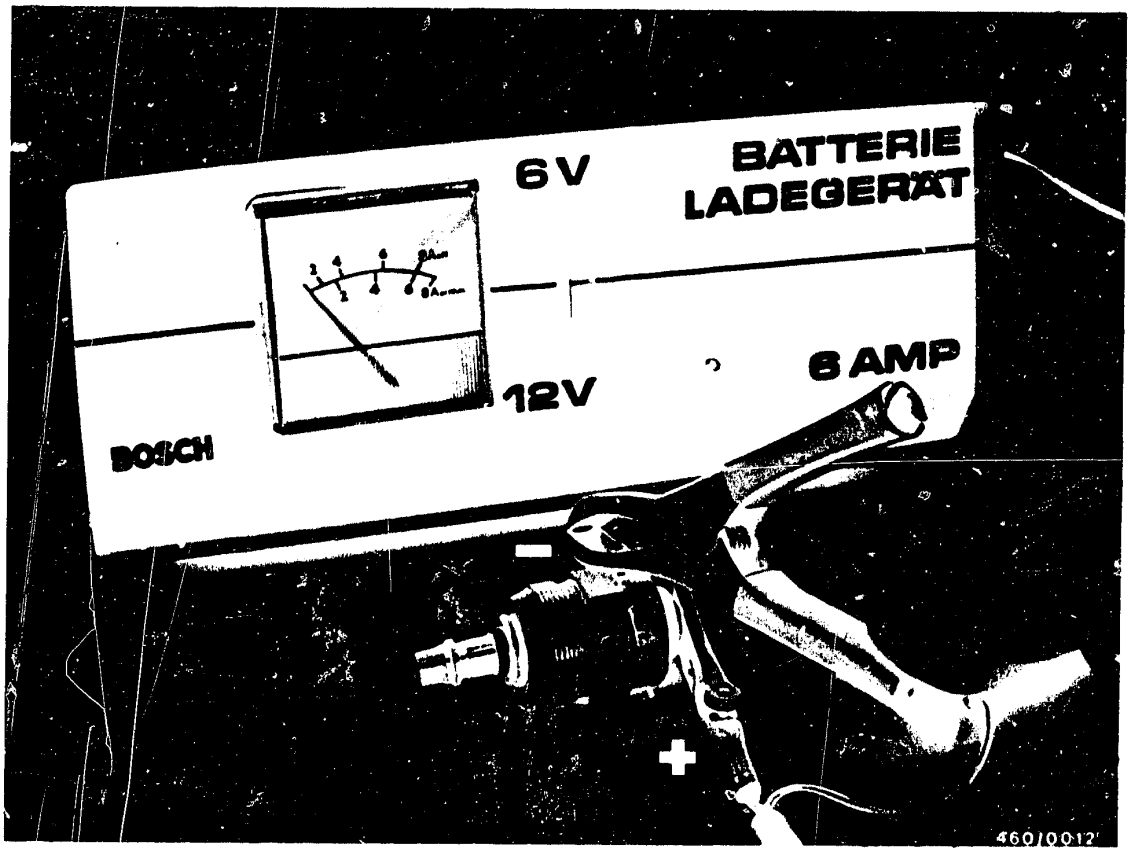
The individual fuel-injection lines are joined together by clamps so that it is not possible to mix up the outlets.
If, nevertheless, there is uncertainty, check the routing of the lines using the above pictures.
The letters A to E identify which injection-pump outlets belong to which engine cylinders.



10. Test overflow restriction

Unscrew overflow restriction on fuel-injection pump (marked "out").

Perform visual inspection of wire screen for impurities. If in doubt, replace overflow restriction.



11. Check operation of shutoff device

11.1 Engine fails to start

Check whether solenoid-operated valve is supplied with voltage (min. 10 V) with glow-plug and starter switch switched on (drive position).
If voltage is present, remove fuel-injection tubing and take out solenoid-operated valve.
Cleanliness is essential.

When removed, check operation of solenoid-operated valve.

Note:
When removed, the solenoid-operated valve must only be supplied with voltage for a short period of time since it is no longer being cooled by the fuel.

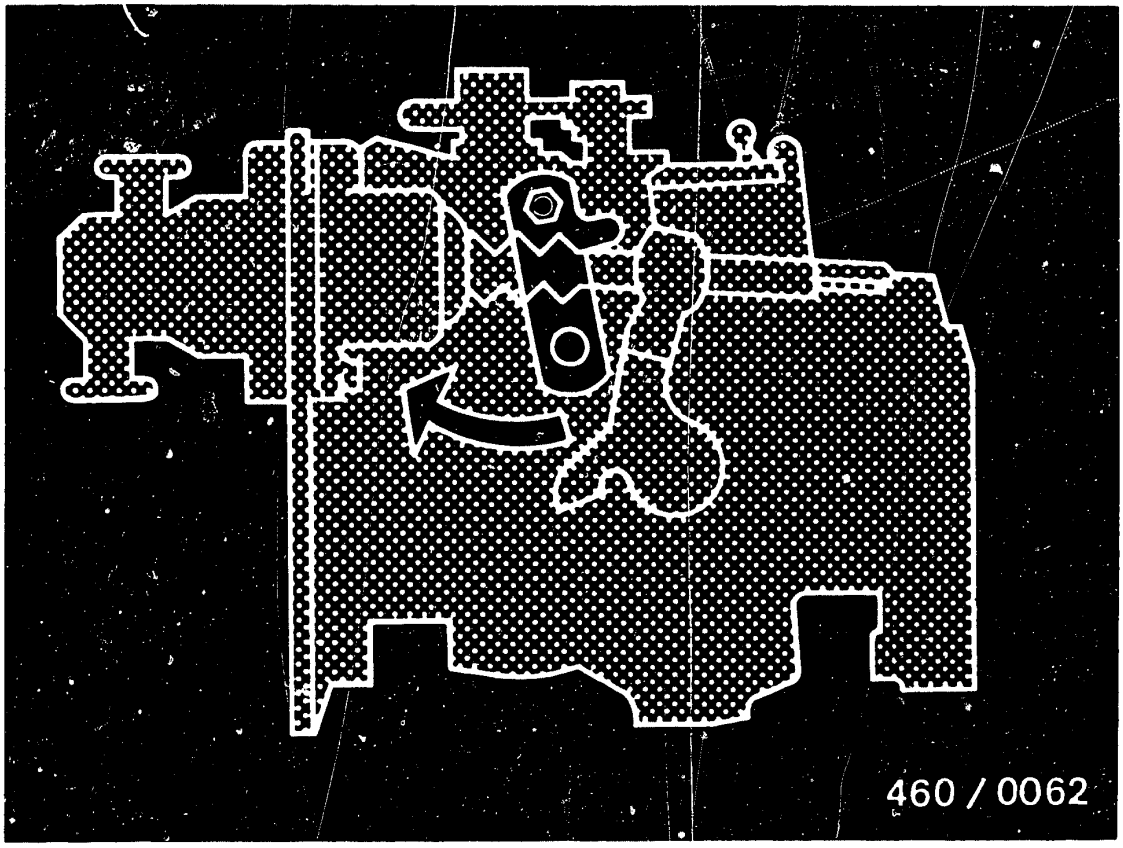
11.2 Engine cannot be stopped

With the glow-plug and starter switch in the stop position, there must be no voltage across the solenoid-operated valve (arrow), i. e. the fuel inlet at the distributor-pump plunger is interrupted.

If the engine continues to run, although there is no voltage across the solenoid-operated valve, the engine can be stopped as follows:

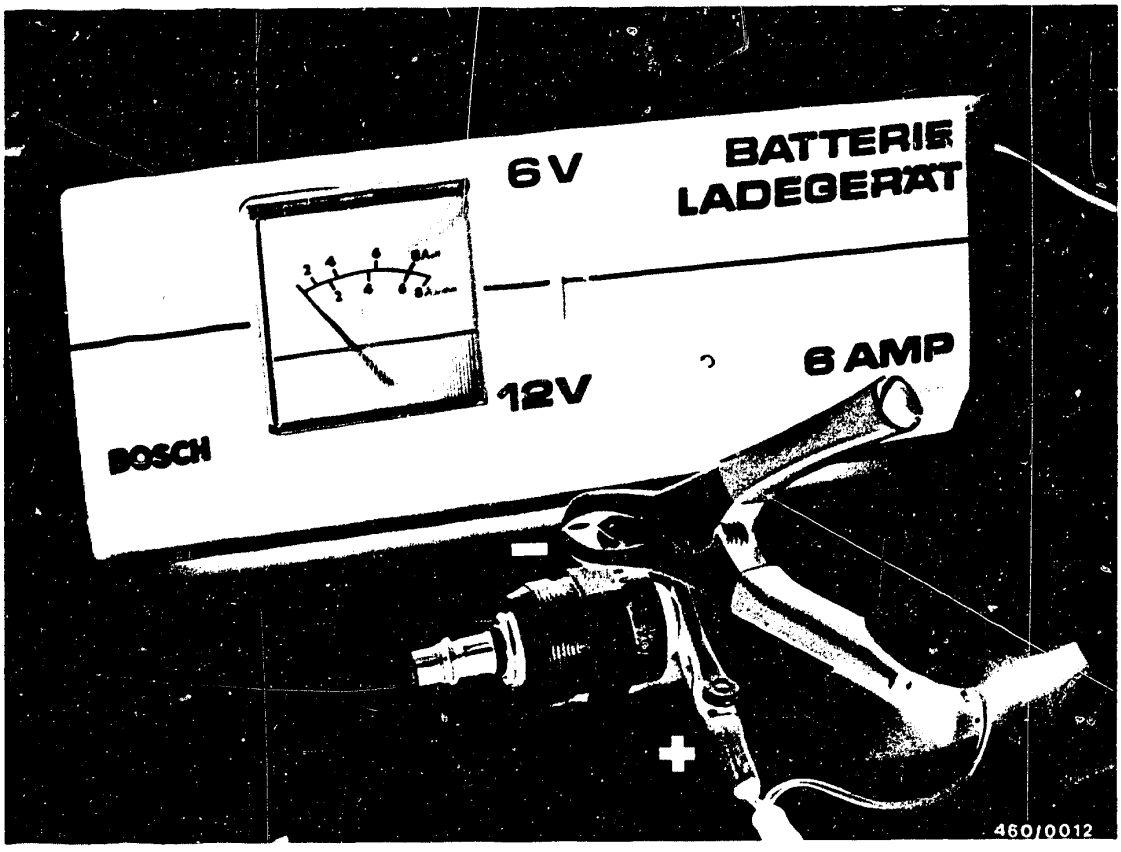
- Vehicles with manually-shifted transmission

Select 3rd or 4th gear.
Depress the foot brake with full force and let out the clutch.



- Vehicles with automatic transmission

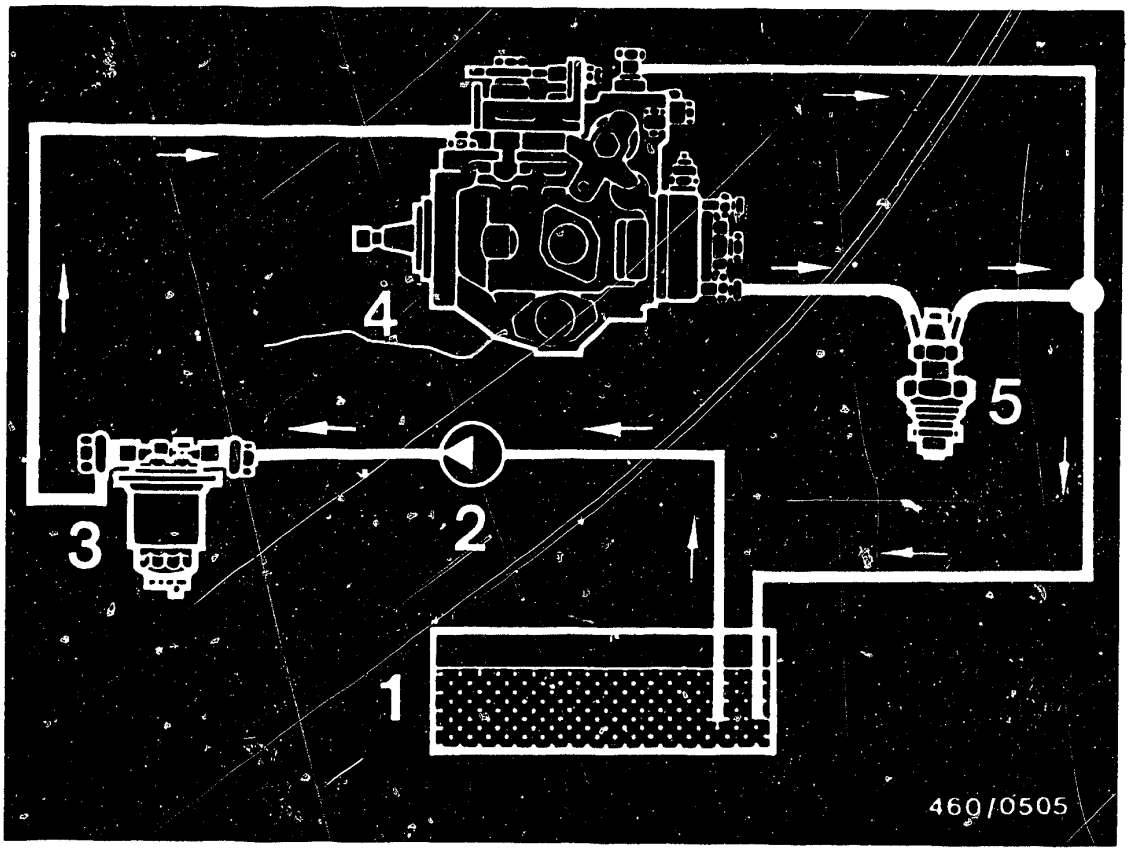
Operate the emergency stop lever on the injection pump (picture).



11.2.1 Solenoid-operated valve test

Remove fuel-injection tubing.
Take out solenoid-operated valve.
Cleanliness is essential.
When removed, check operation of solenoid-operated valve.

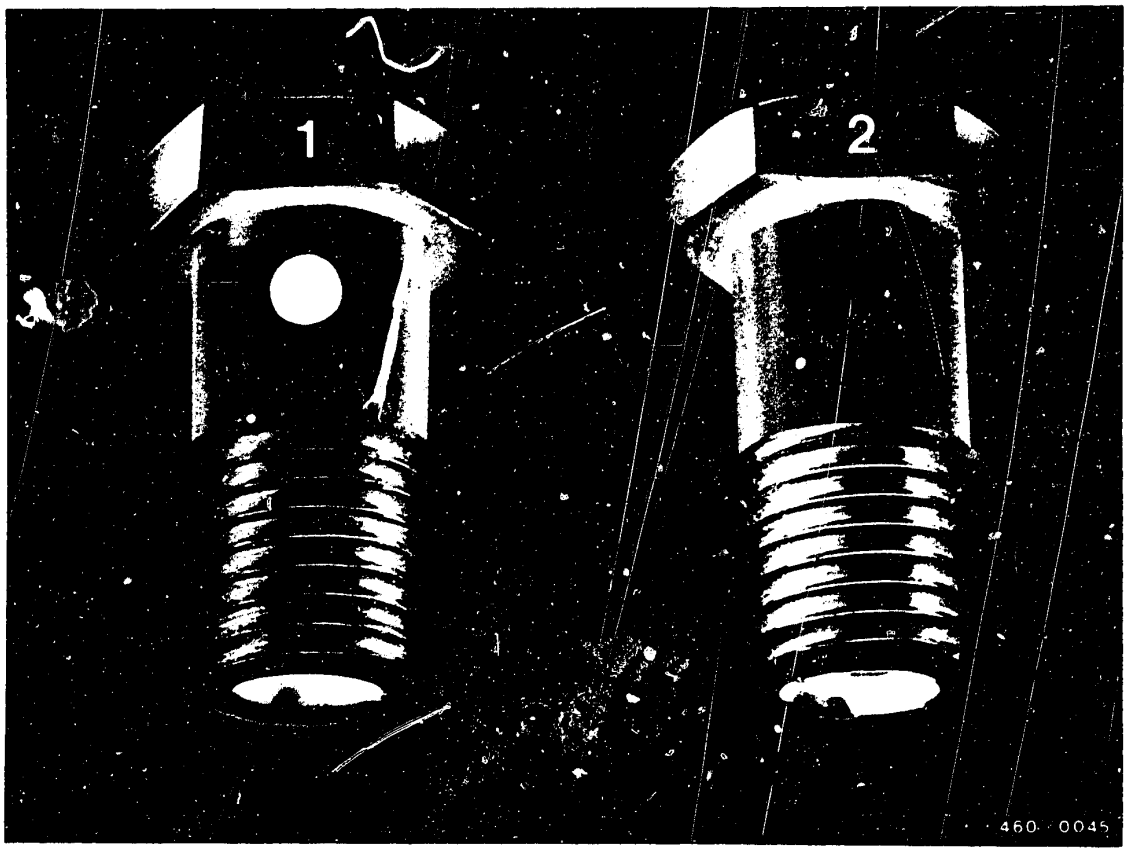
Note:
When removed, the solenoid-operated valve must only be supplied with voltage for a short period of time since it is no longer being cooled by the fuel.
Check valve seat in hydraulic head (visual inspection).



1 = Fuel tank
2 = Fuel pre-supply pump (on export models only)
3 = Fuel filter
4 = Distributor-type fuel-injection pump
5 = Injection nozzles

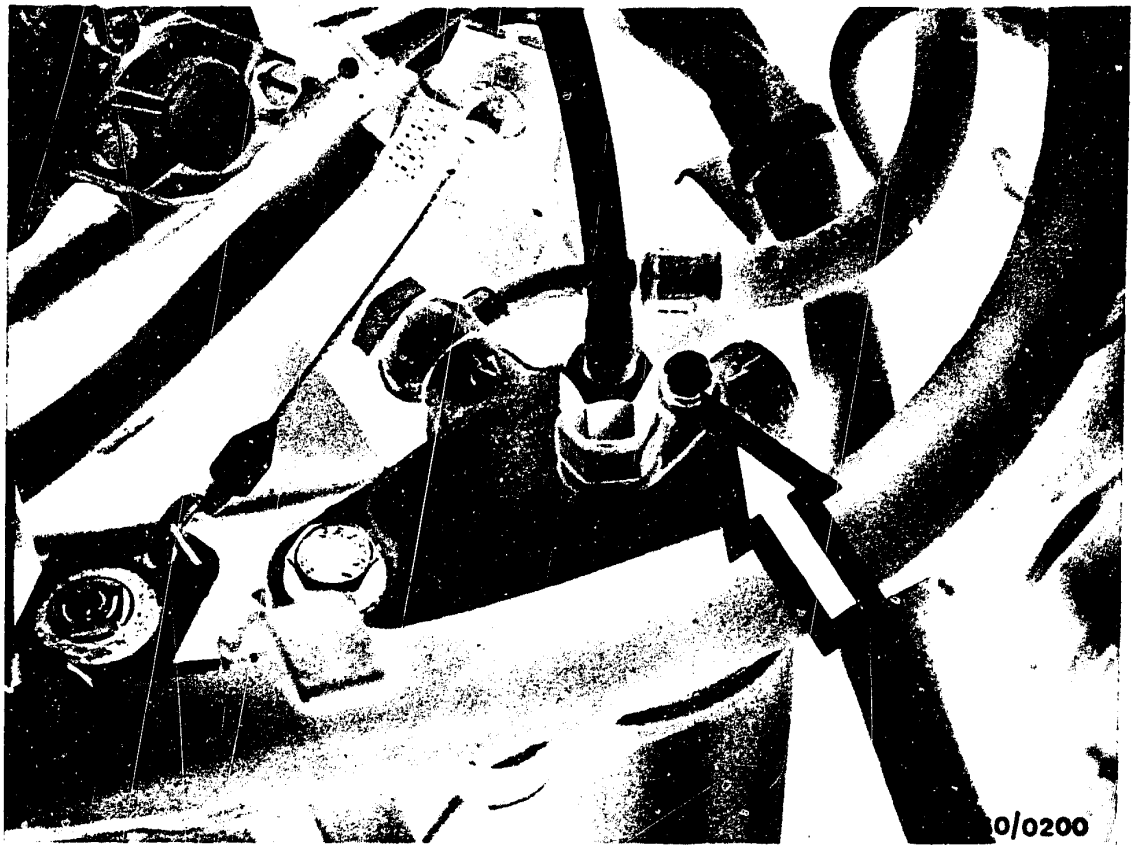
12. Connection diagram of fuel lines

The fuel lines are connected as shown in the above diagram.
The fuel flows in the direction of the arrows.



As regards the connections to the fuel-injection pump, ensure that the inlet-union screw for fuel inlet (1) and the throttle screw for fuel return (2) are not mixed up.

The throttle screw is located on the cover of the fuel-injection pump and the head of the screw is marked with the word "out".



13. Bleed fuel system

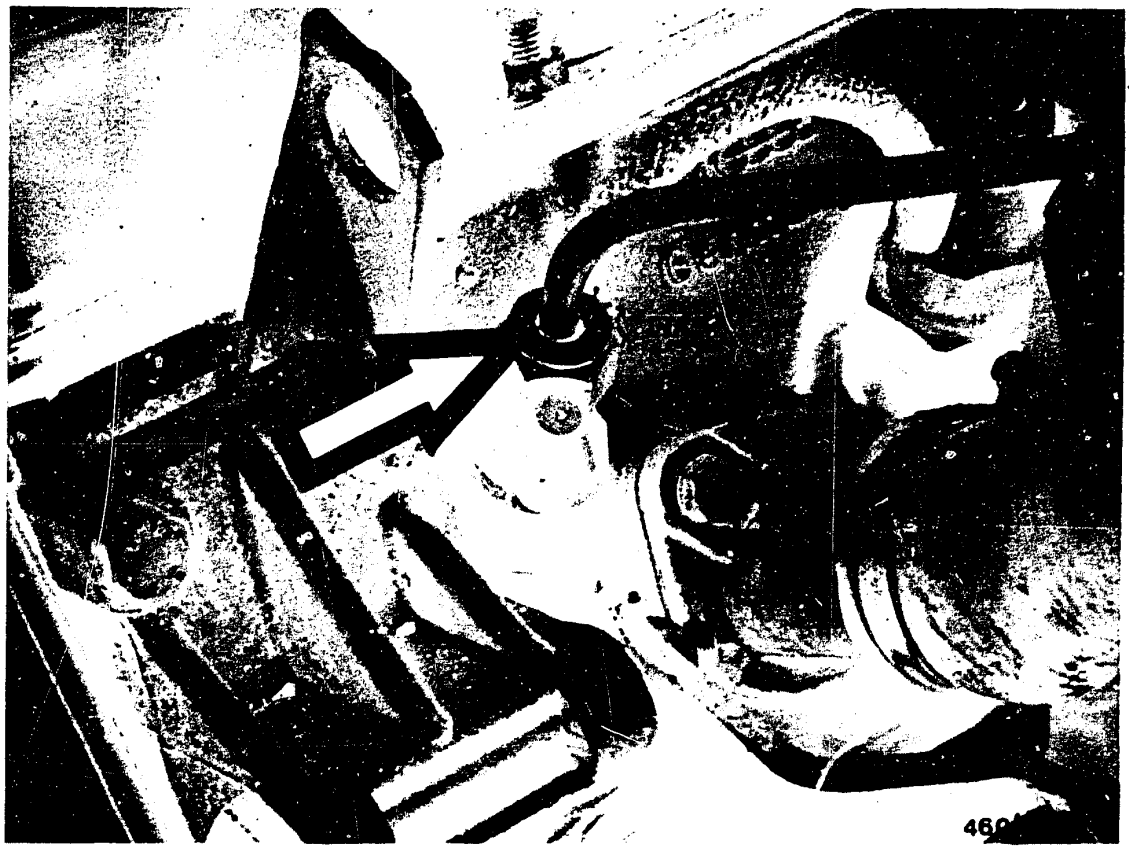
Fill the fuel filter and injection pump with diesel fuel.

Tighten hose connections on filter cover.
If fitted, close bleeder screw on fuel filter (arrow).

Loosen bleeder screw on injection pump and screw out by a few turns (arrow).

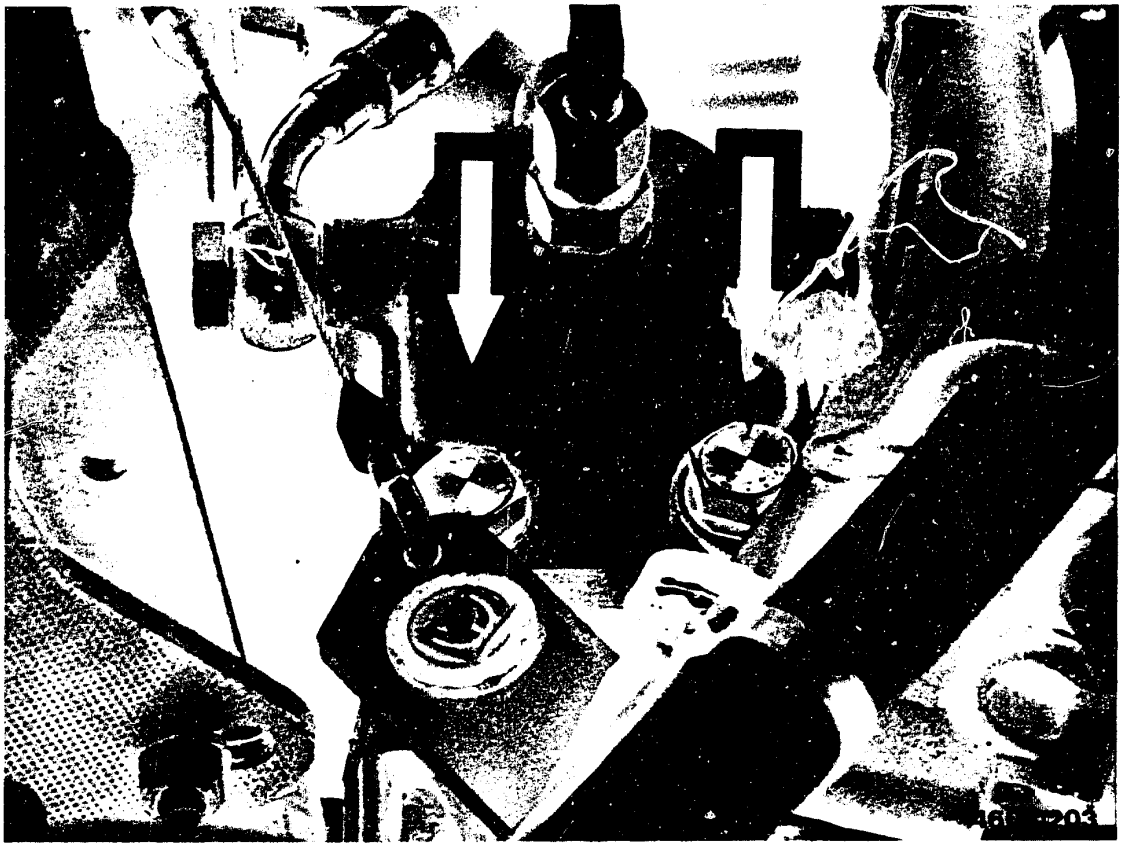
Loosen union nuts of fuel-injection tubing on nozzle holders.

Operate starting motor without preheating. When the fuel escaping from the injection pump bleed hole is free of bubbles, retighten the bleeder screw again.



Continue to operate starting motor until fuel escapes from the union nuts of the nozzle holders (arrow).

Tighten union nuts and operate starting motor until engine starts.



14. Replace and drain water from filter box

14.1 Replace filter box

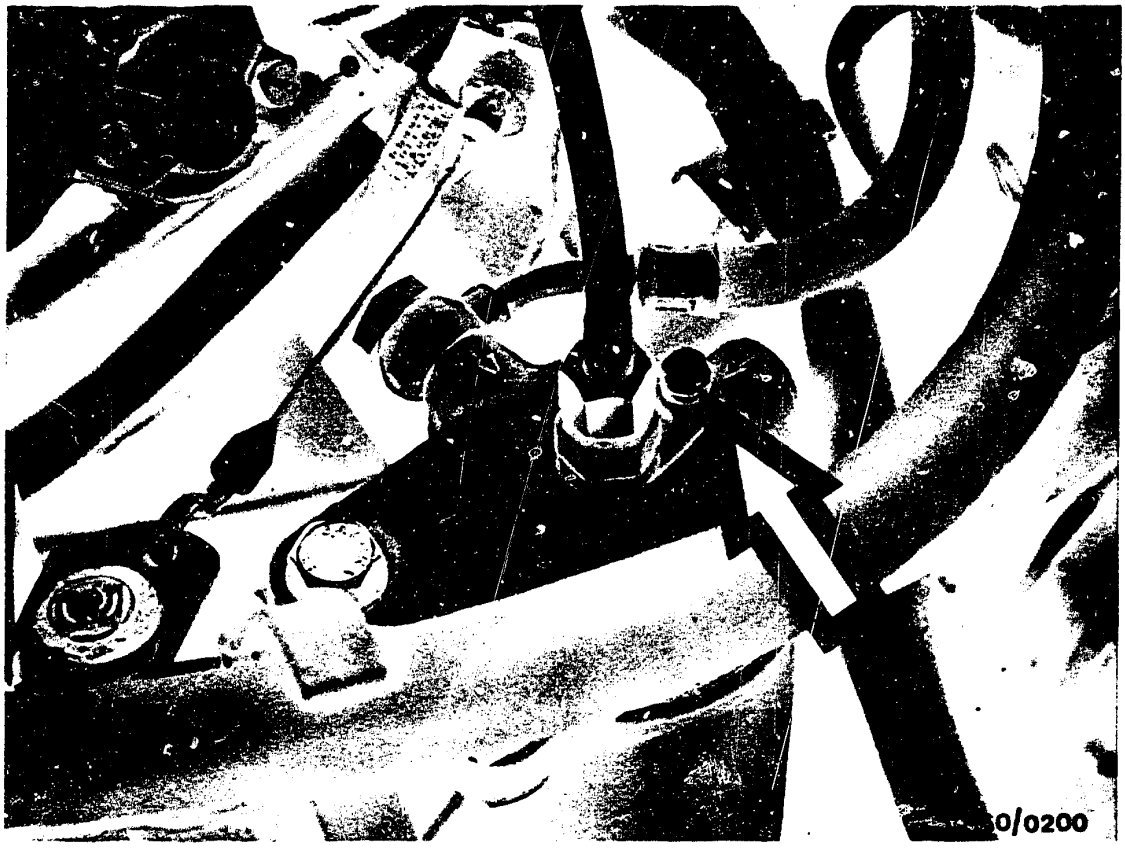
- Remove connection hoses from top part of filter.
- Loosen fastening screws (arrows) on filter cover.
- Screw out filter box and drain.
- If stuck, loosen filter box using special wrench, e. g. Matra W 167.

Rub diesel fuel into the rubber seal (arrow) of the new filter box.

Screw the filter box into the cover by hand and tighten.

Check the fuel filter for leaks.

In the case of winter fuel it may be necessary to add petroleum as specified by the vehicle manufacturer.



14.2 Drain water from fuel filter

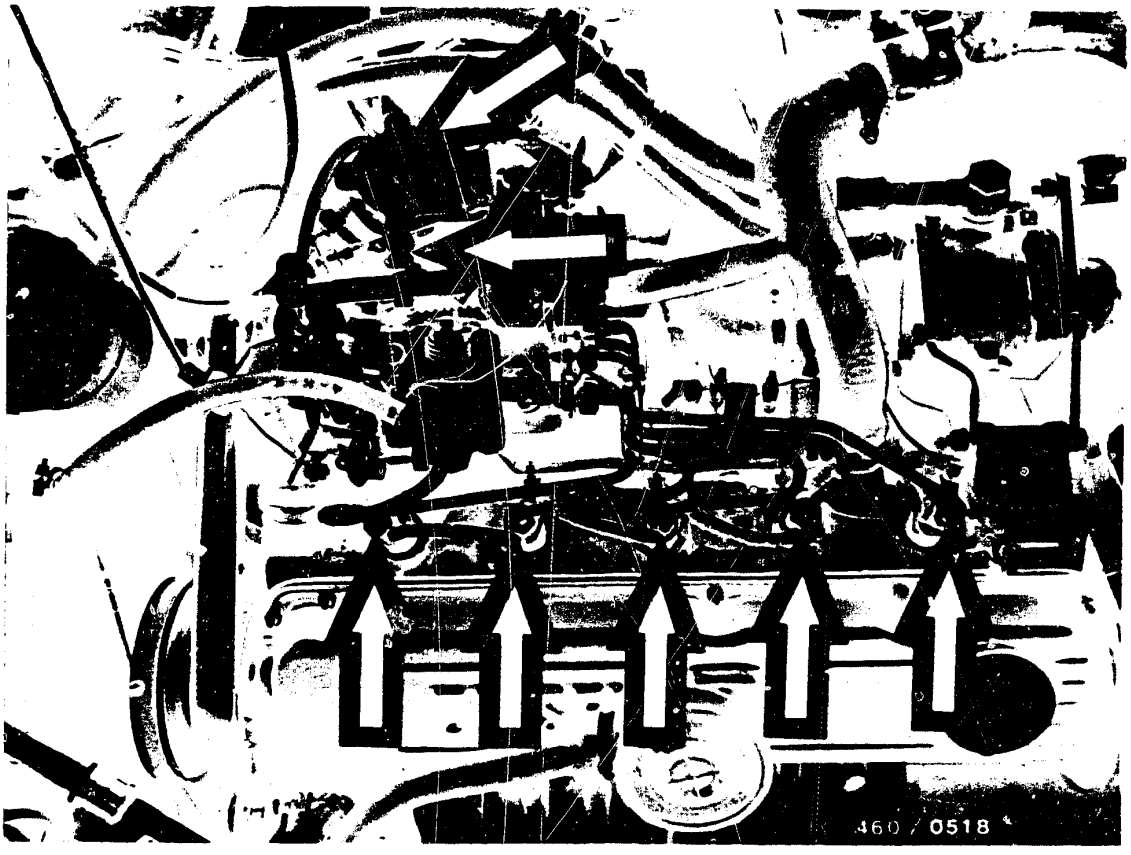
Loosen bleeder screw (arrow) on filter cover by a few turns.

Loosen water-drain plug on base of filter and drain water.

Catch liquid in collector vessel.

Tighten water-drainplug and bleeder screw and test for leaks.

If necessary, bleed fuel filter.

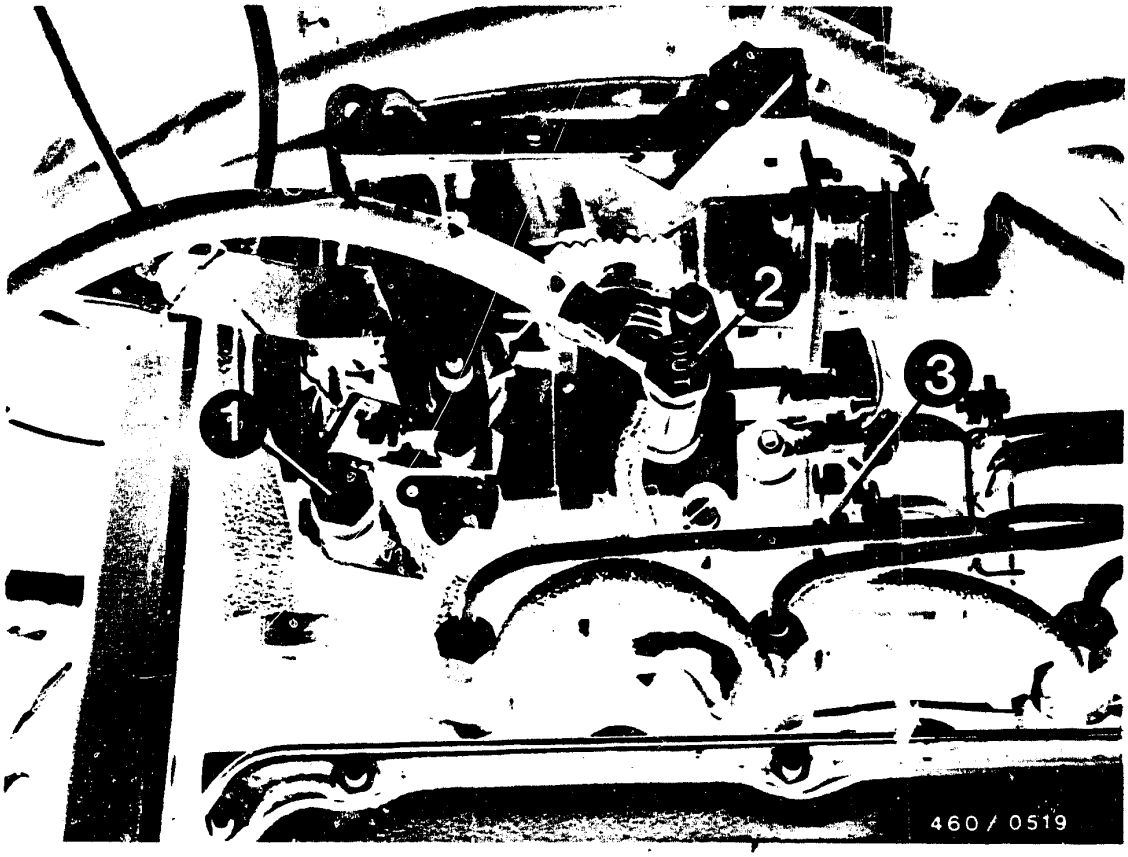


15. Test injection system for leaks

The leak test must be performed with the engine at normal operating temperature.

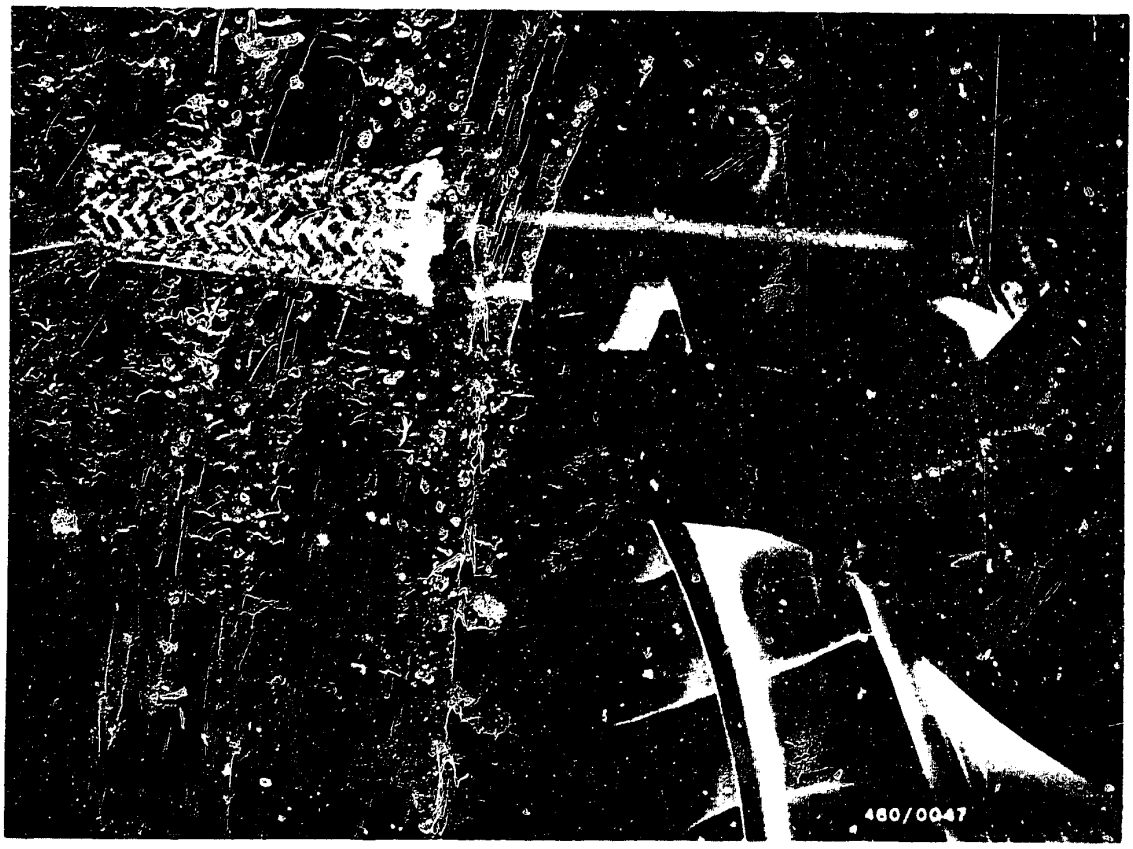
For the leak test, examine all connection points of the fuel lines.
Pay particular attention to:

- Connections on fuel filter (top arrows).
- Connections at nozzle holders (bottom arrows).



- Inlet line (1) and return line (2) on distributor-type injection pump.
- Delivery-valve holders on hydraulic head (3).

Examine fuel lines for hairline cracks.



16. Check fuel lines

Subject suspect fuel lines to a visual inspection.

If there is no detectable pinching or kinking, the fuel line in question must be removed.

Check fuel line for throughflow using compressed air and clean if necessary.

A suitable hose piece may be used as a side seal for blowing out the fuel lines.

17. Smoke test - check air filter

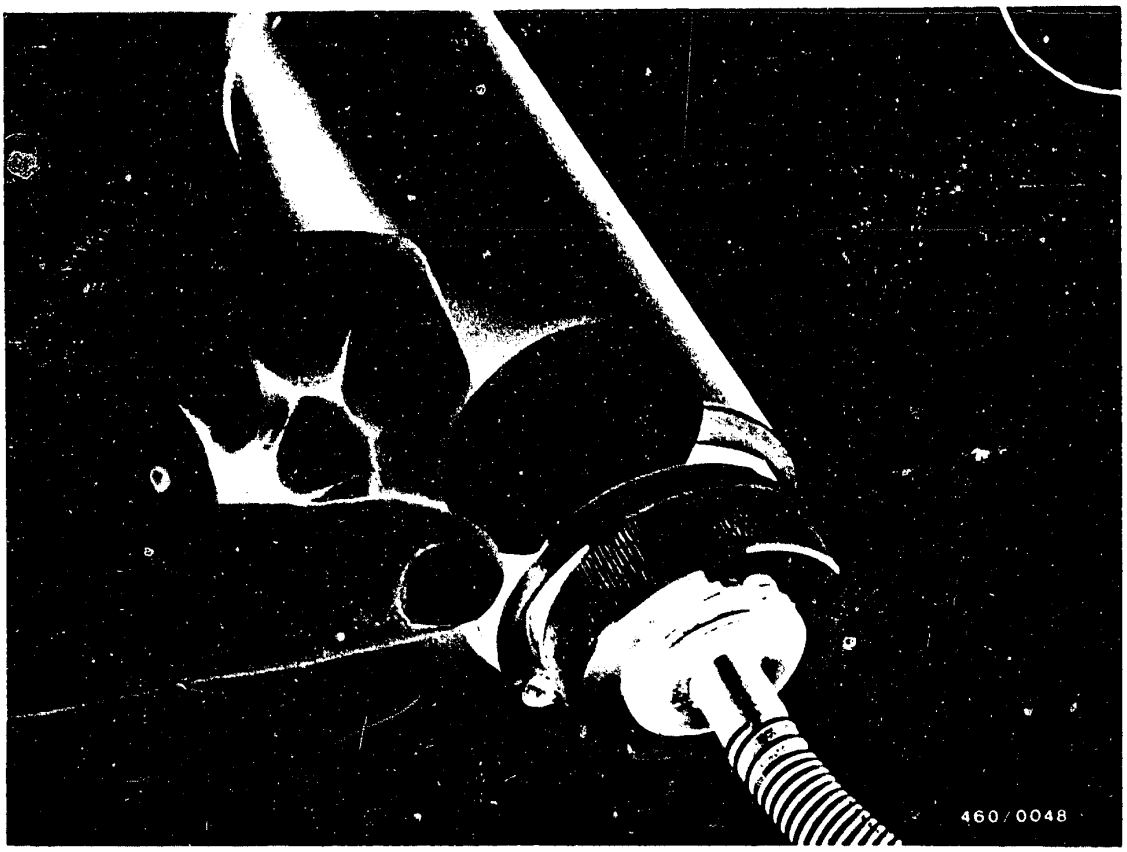
17.1 Smoke test

Summary of the contents of the legal regulations (as at April 1978). Applicable to Federal Republic of Germany.

This regulation applies only to the homologation of motor vehicles having at least 4 wheels with a maximum permissible speed of more than 25 km/h. A smoke emission test is not prescribed for official general inspections.

Parts which may have an influence on environmental pollution must be designed in such a way that the legal requirements are met during operation and despite vehicle vibration.

This applies in particular to cold-start devices and full-load stops. The Rheinland-Westfälische TOV (Technical Inspection Bureau of Rhineland-Westfalia) in Essen is the sole approval agency.

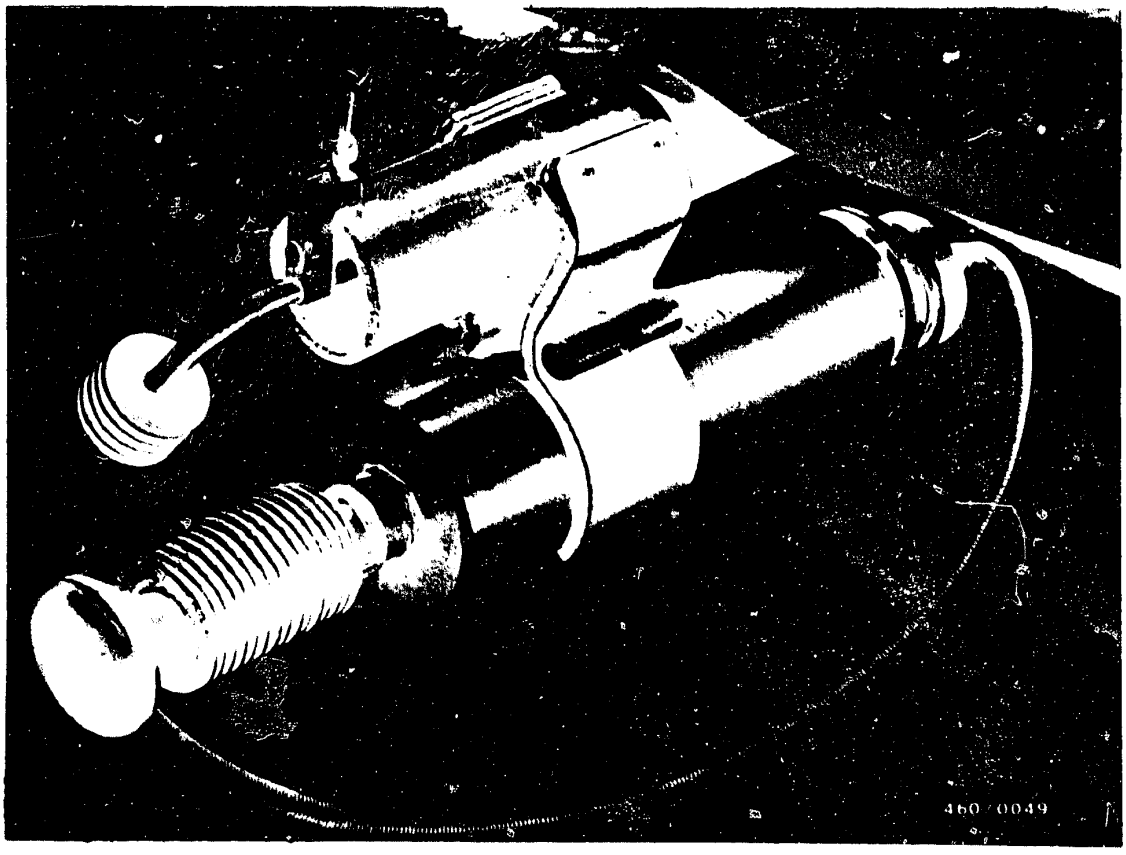


17.1.1 Test setup*

The smoke test is conducted using the Bosch filter-type smokemeter.
The filter-type smokemeter consists of the following units:

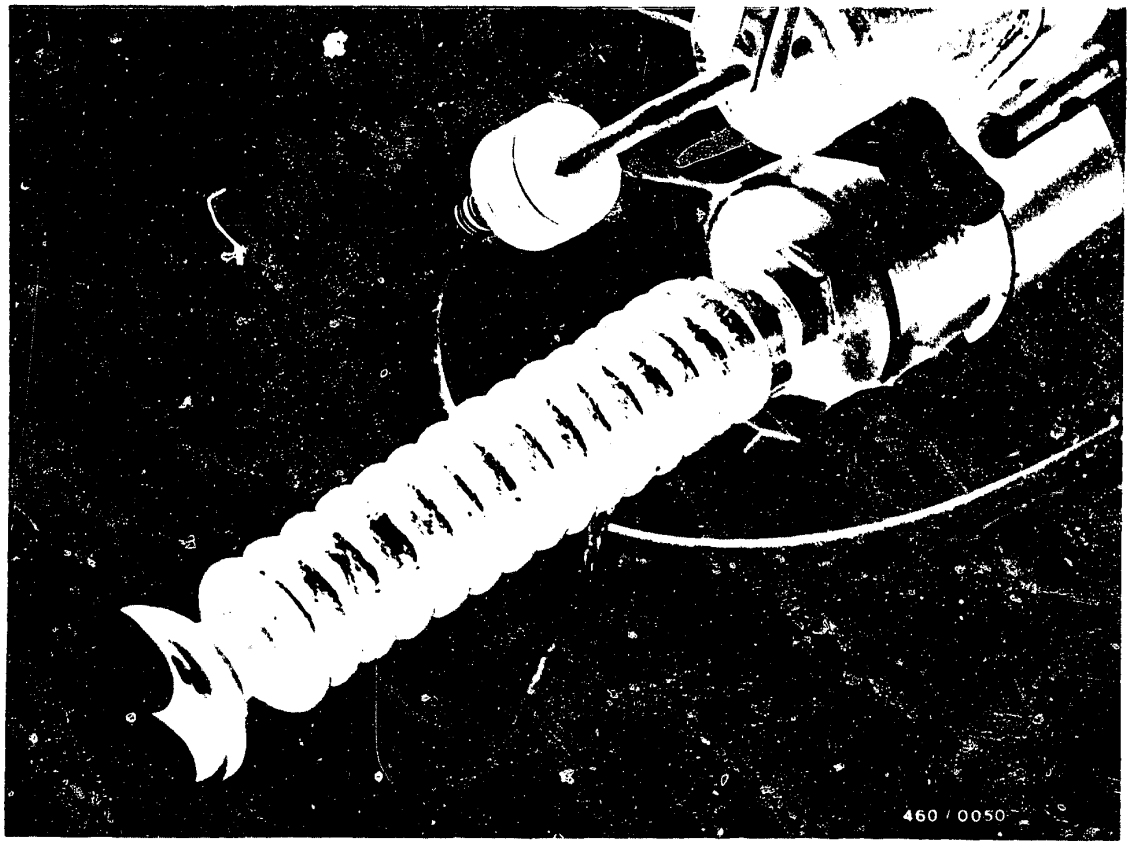
Accessories box with proportioning pump	0 681 169 038
Evaluating unit	0 681 169 039

Insert filter plate into proportioning pump.



Mount sampling pump on exhaust pipe using appropriate clamp.

Introduce exhaust-sample pickup as far as possible into exhaust pipe and clamp in position.

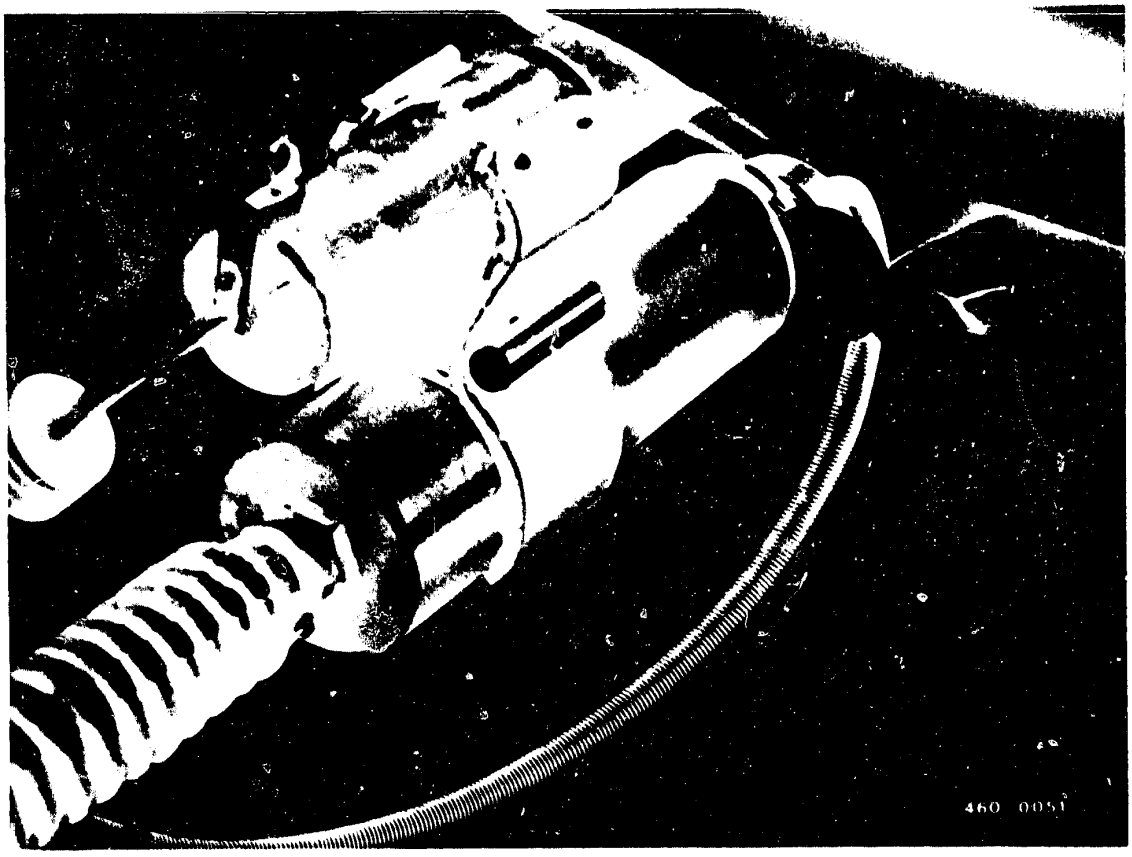


17.1.2 Test procedure

Set proportioning pump by pressing in the black push-button.
Take rubber ball on triggering hose and enter passenger compartment.

The test can be performed on the chassis dynamometer or on the road (gradient).

The chassis dynamometer is preferable in any case. Find the gear in which, with the accelerator pedal in the full-load position, a speed of approx. 40 km/h is reached. Load the engine so that, with the accelerator in the same position, a speed of approx. 25 km/h is reached.

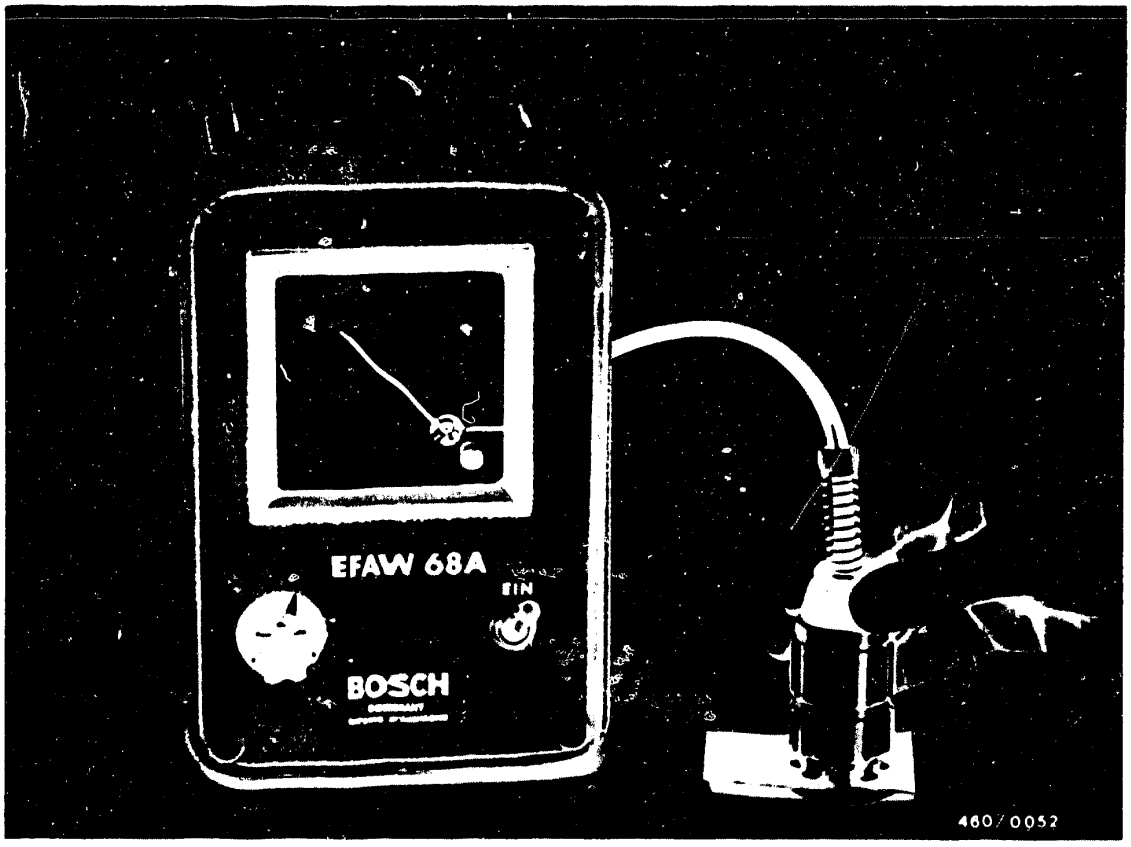


Maintain this load condition for 5 seconds and then trigger the sampling pump by pressing the rubber ball.

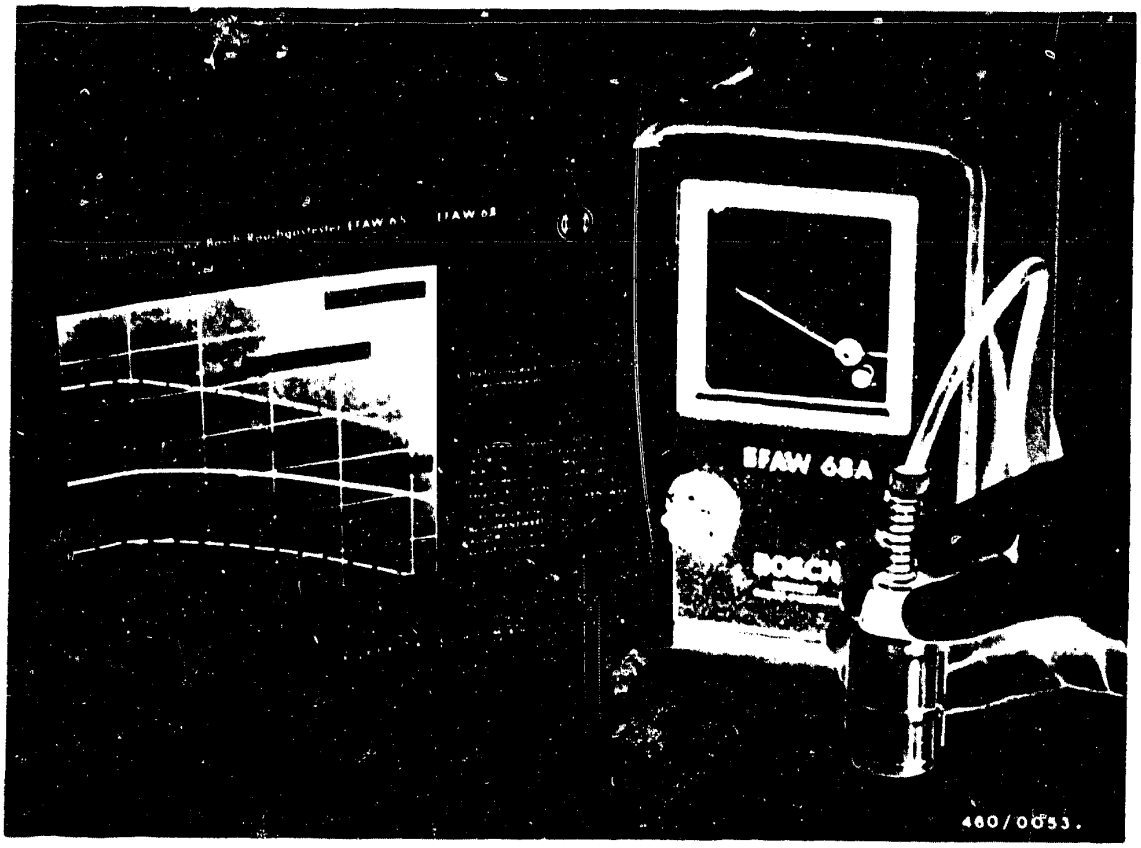
Switch off engine.

Caution!
During the following operation, pay attention to the fact that the exhaust pipe has been heated due to the running of the engine.

Remove filter plate from sampling pump.

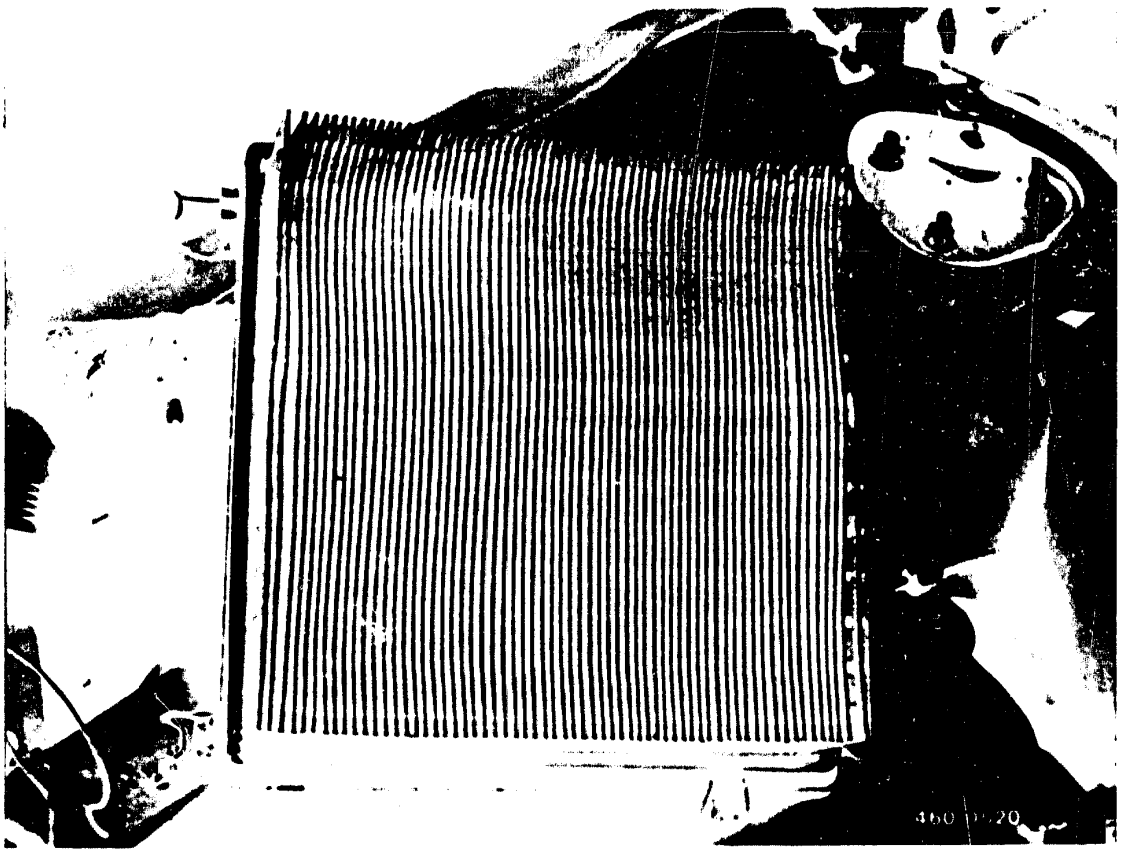


Place calibrating plate on approx. 10 clean filter plates. Place photocell of evaluating unit on calibrating plate. Switch on unit and set to 5.0 opacity. Remove calibrating plate and place photocell on clean filter plates. The unit must indicate 0.0 opacity. If necessary, change batteries.
With unit switched off, pointer must indicate 10.0 opacity. Deviations indicate that the unit is defective.
Place filter plate from sampling pump onto the clean filter plates with the sooted side at the top.
Place photocell on this filter plate and read off the smoke factor on the evaluating unit.



Compare smoke factor with evaluation sheet.

Note kW (HP-DIN) data of vehicle manufacturer.



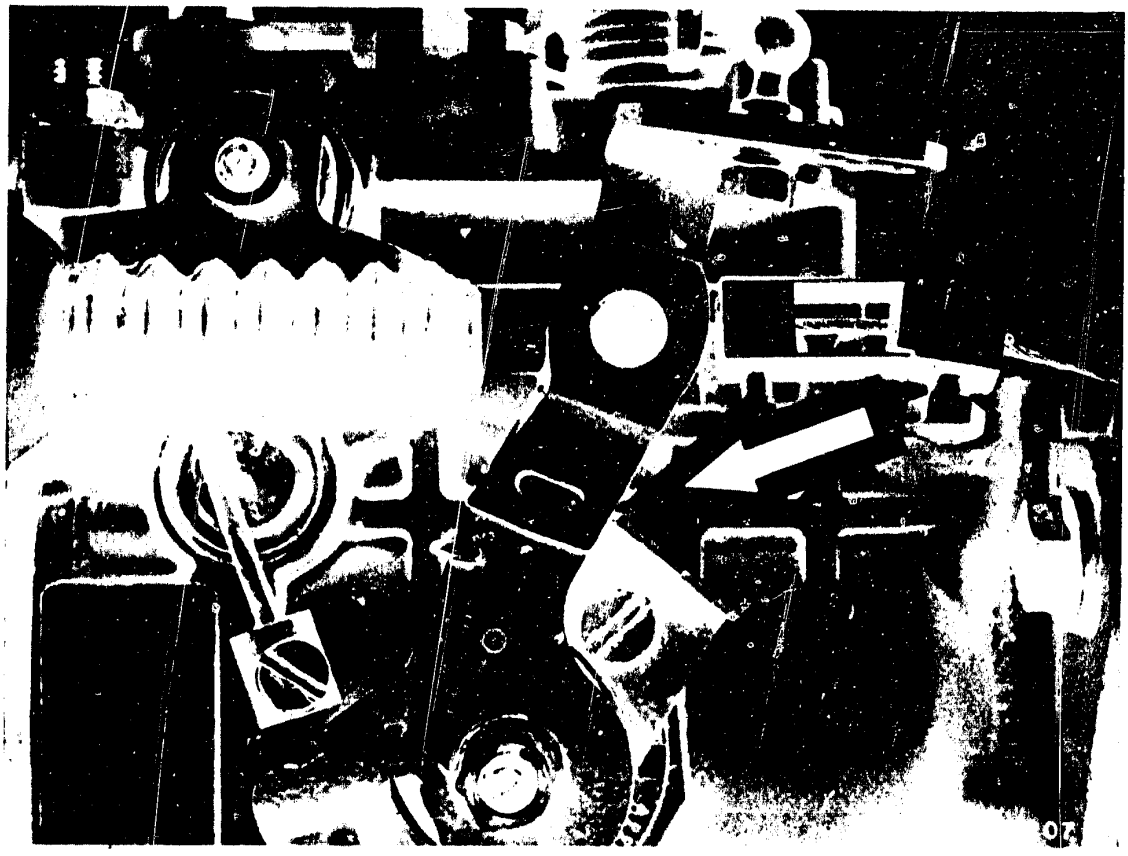
17.2 Check air filter

Remove air filter and subject to a visual examination.

Test criteria for air filter:

- Dusty air filter (test by knocking out air filter)
- Oil-fouled air filter
- Solid matter in air filter, e. g. leaves.

If in doubt, use a new filter element.

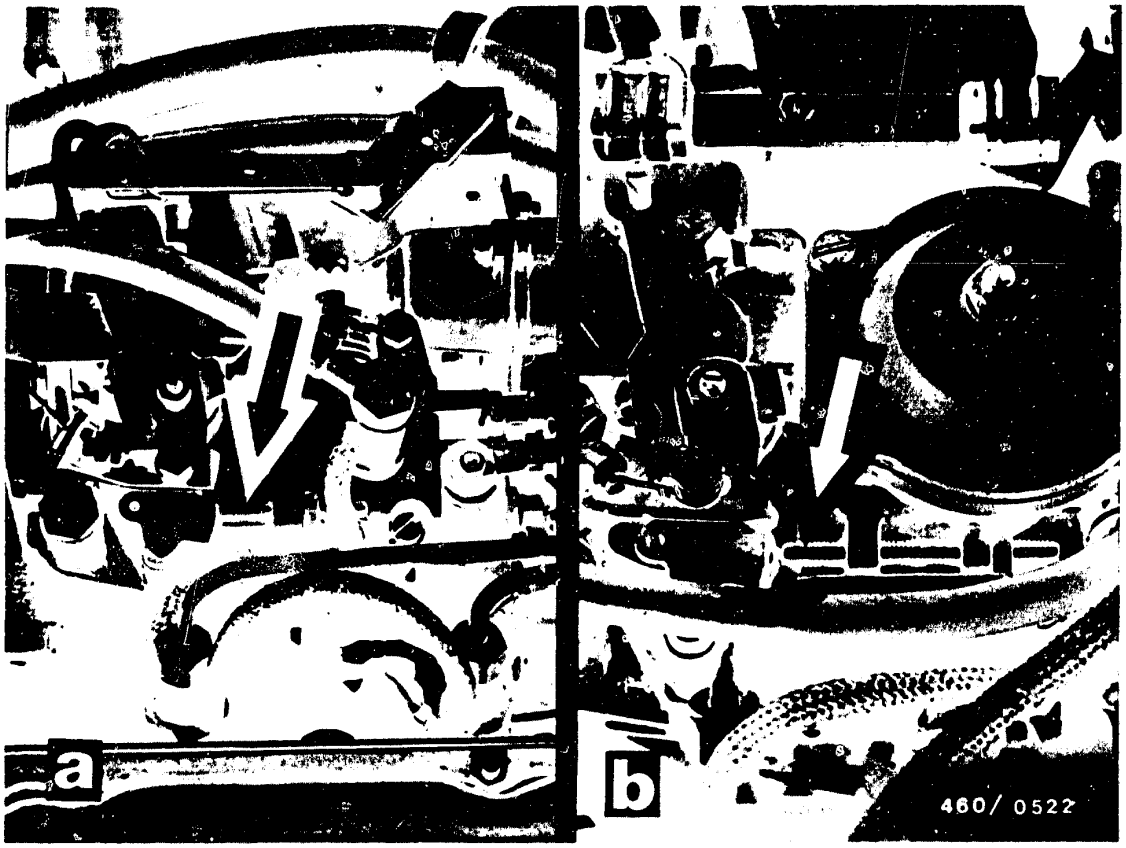


18. Adjust idle speed

Connect tachometer (e.g. photoelectric) to engine.
Start engine and run at idle speed.

Caution!

To adjust the idle speed, the engine must be at normal operating temperature.
The control lever of the cold-start accelerator must be up against the stop bracket (arrow).
Coolant temperature + 80°C.

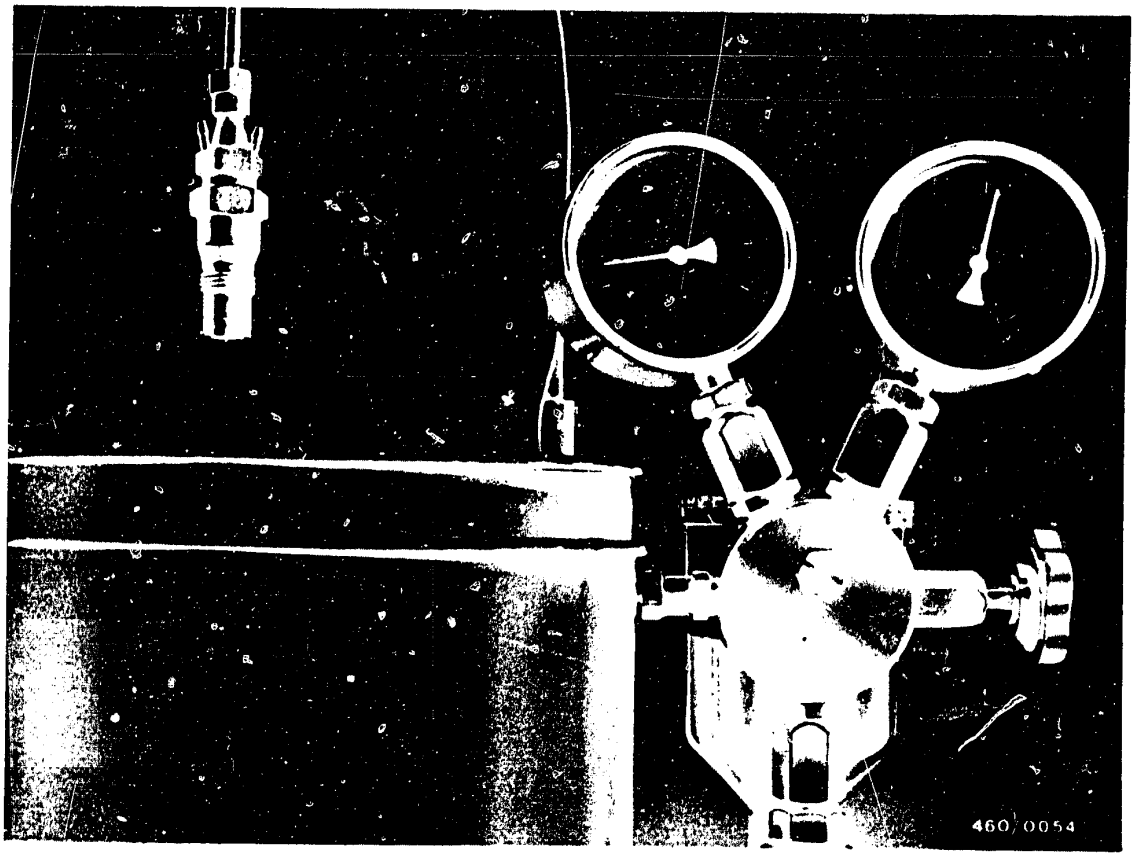


Picture a = AUDI 100 5 D Picture b = AUDI 100 5 D-Turbo

Adjust engine speed to 750 ± 30^{-1} at the idle-speed adjusting screw (arrow).

Note that the camshaft and the injection pump are driven at half the engine speed.

After adjusting, lock and seal the adjusting screw.



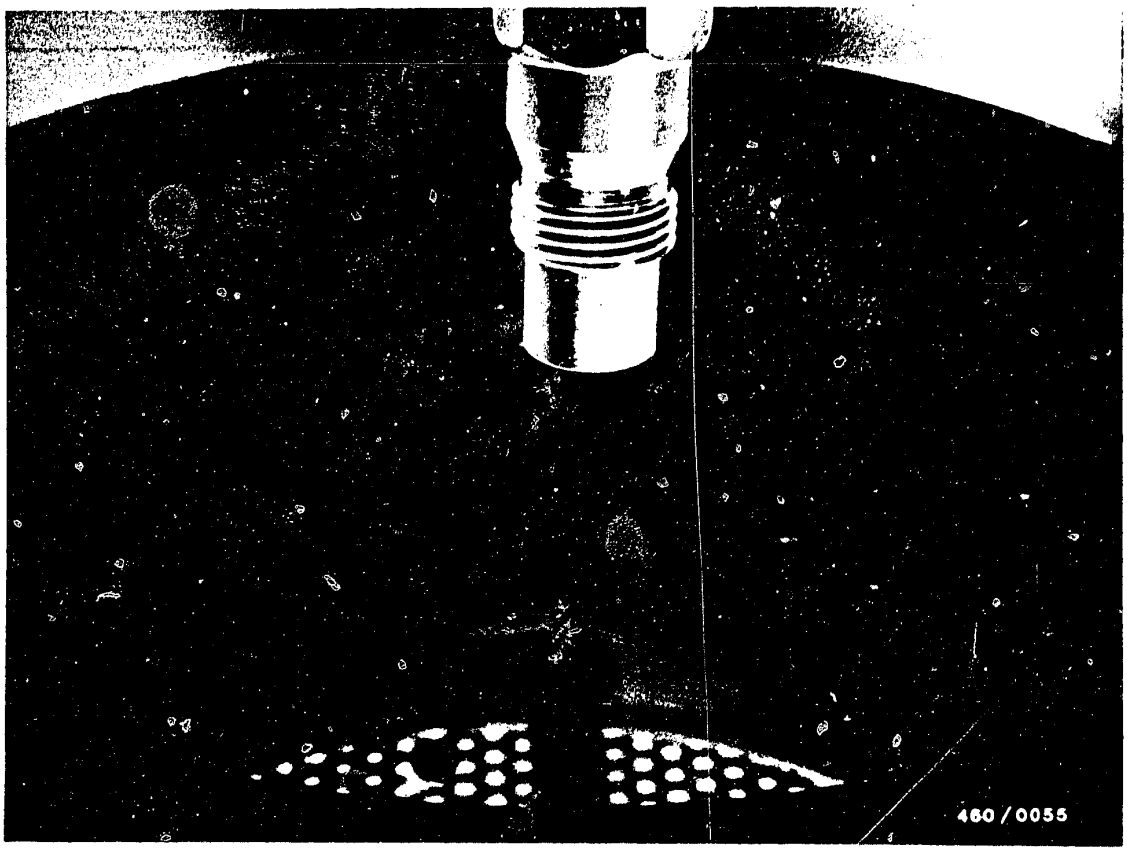
19. Test injection nozzles

Remove injection nozzles.

The test is performed using the nozzle tester EFEP 60 H 0 681 200 502.

Mount injection nozzle with nozzle-holder assembly on nozzle tester.

Caution:
When testing injection nozzles, make sure that the fuel spray does not strike your hands since, due to the high pressure, the fuel will penetrate into the skin and may cause blood poisoning.



19.1 Spray test

Switch off pressure gauge.

The spray pattern cannot be assessed until when the lever is being operated quickly (approx. 4-6 strokes per second). The spray must be quite concentrated and break off cleanly.

19.2 Chatter test

Pressure gauge is off.
Fully press lever of tester slowly (1 ... 2 strokes per second).
Good nozzles must chatter as soon as fuel escapes.

19.3 Test injection pressure

Switch on pressure gauge.
Slowly press lever downward.
Read off injection pressure when fuel begins to squirt.
In case of deviations from the set value the nozzle-opening pressure must be corrected by shims behind the pressure spring in the nozzle-holder assembly.

Set value	AUDI 100 5 D:	130 + 8 bar
	AUDI 100 5 D - Turbo:	155 + 8 bar

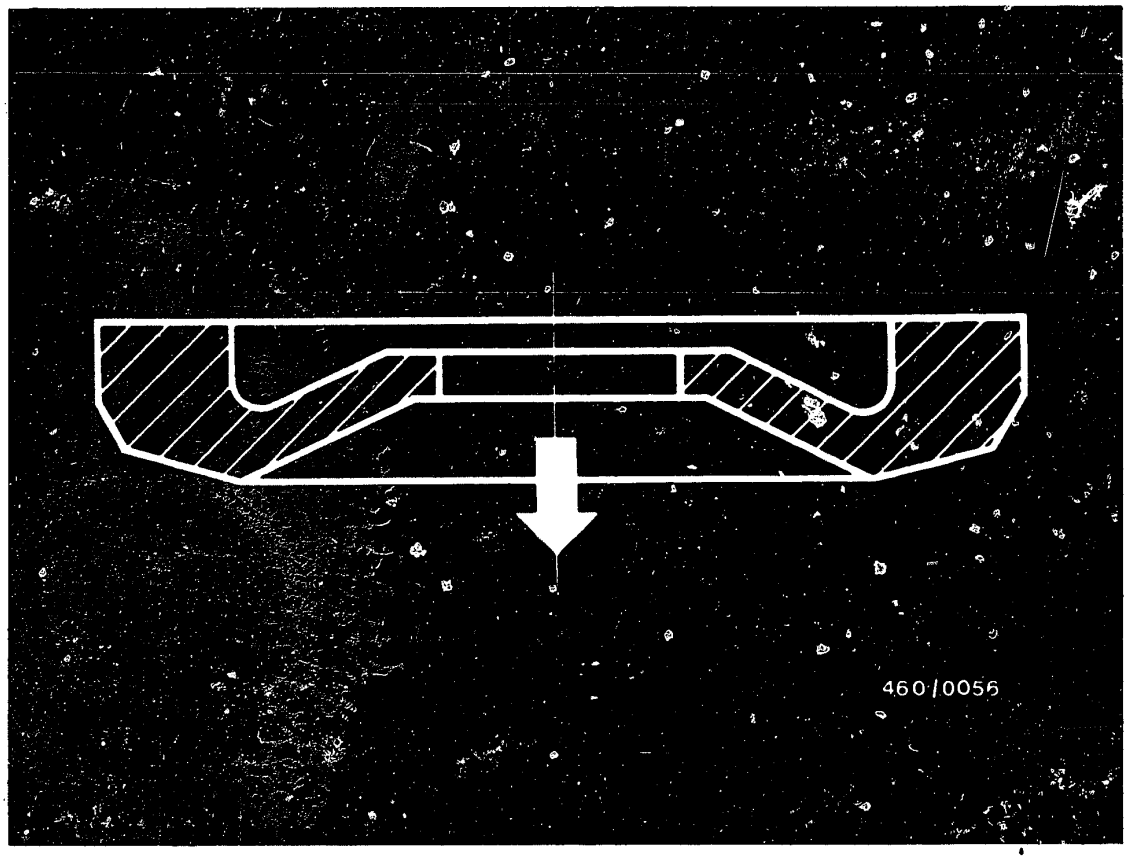
Thicker shims = higher nozzle-opening pressure

Thinner shims = lower nozzle-opening pressure

Increasing the spring travel by 0.05 mm causes an increase of the nozzle-opening pressure of 5.0 bar.

19.4 Leak test

Pressure gauge on.
Slowly press lever downward and maintain pressure approx. 20 bar below the opening pressure for 10 seconds. No drop may fall from the nozzle.

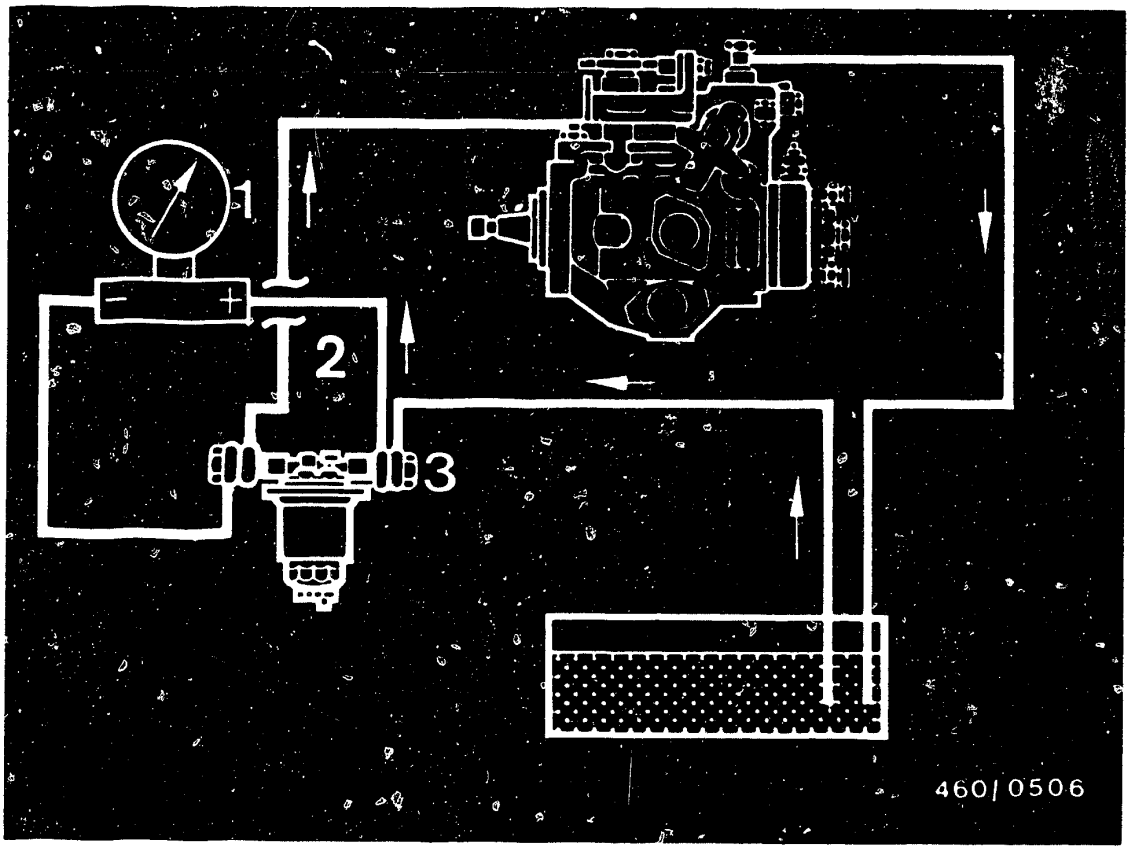


19.5 Install injection nozzles

Before installing the injection nozzles, fit a new heat seal in the direction of the arrow with respect to the cylinder head (Picture).

Tighten the fastening screws of the nozzle-holder assembly to 70 Nm (7.0 kgfm).

Tighten the union nuts of the fuel-injection tubing to 25 Nm (2.5 kgfm).



1 = Differential-pressure gauge
2 = Filter outlet (use inlet union and extra-long inlet-union screw 2 443 456 020).
3 = Filter inlet (use inlet union and extra-long inlet-union screw 2 443 456 020).

20. Check fuel filter

Connect differential-pressure gauge to fuel filter using appropriate connecting pieces.

Connect the (+) side of the differential-pressure gauge to the fuel filter inlet. Fit the (-) connection of the pressure gauge to the filter outlet. See connection diagram.

Run engine until you are sure that there is no air in the fuel system.

Move injection-pump control lever briskly (approx. 1 sec) from the idle stop to the maximum speed stop.

Release control lever and read off differential pressure on pressure gauge.

The differential pressure may be max. 0.3 bar. If this value is exceeded, replace filter. Remove test connections.

If necessary, bleed fuel system.

21. Check pre-heating system

21.1 Necessary test equipment

Voltmeter/ammeter	e.g. ETT 011.00	0 684 101 100

21.2 Workshop information

21.2.1 We recommend that the "R"-type sheathed-element glow plugs be replaced every 45 000 km.

21.2.2 Pre-heating times

The pre-heating time is dependent on the ambient temperature.

Check pre-heating system

Note:
ATT engines are equipped with a rapid pre-heating system.

- Before testing, make sure that battery is O.K.

Test power supply

- Connect test lamp between glow plug of cylinder 4 and ground.
- Remove lead from engine-temperature sensor.
- Turn ignition key to pre-heating for max. 15 seconds; test lamp must be lit.
- Re-connect lead to engine-temperature sensor.

Test lamp lit?

No

Continued on D4/D5

Yes

The glow plugs can be tested either with a test lamp or with the voltmeter/ammeter ETT 011.00.

1. Testing the voltage of the glow plugs with test lamp:

- Remove lead and bus bar for glow plugs.
- Connect test lamp to battery + and contact against each glow plug one after the other.
- Lamp lit = Glow plug O.K.?
- Lamp not lit, glow plug defective, replace (tightening torque 40 Nm).
  See note in case of burned elements.

2. Testing the power supply to the glow plugs with voltmeter/ammeter ETT 011.00:

- Connect ammeter (e.g. ETT 011.00) into lead for glow plugs.
- Remove lead from engine-temperature sensor.
- Turn ignition key to "pre-heating" for max. 15 seconds.
- Read off current consumption.

  Set value: 48 A

Set value reached?

No

Note:
Current consumption after stabilization approx. 12 A per glow plug. If there is a current consumption of the glow plug of approx.
36 A = one glow plug defective
24 A = two glow plugs defective
12 A = three glow plugs defective
0 A = all glow plugs defective

These values are only reached in the case of a battery voltage above 11.5 V.

Yes

Glow plugs O.K.
(Fault is in the fuel supply).

Check pre-heating system (continued)

Fuse for glow plugs defective

- Check fuse for glow plugs.

Test lamp lit?

No → Replace defective fuse.

Yes ↓

Terminal 30 on relay for glow plugs not receiving any voltage

- Connect test lamp to terminal 30 of relay.

Test lamp lit?

No → **Possible causes:**
- Open circuit from terminal 30 to battery.
- Lead defective; replace. (No voltage on V 30)

Yes ↓

Relay for glow plugs not tripping

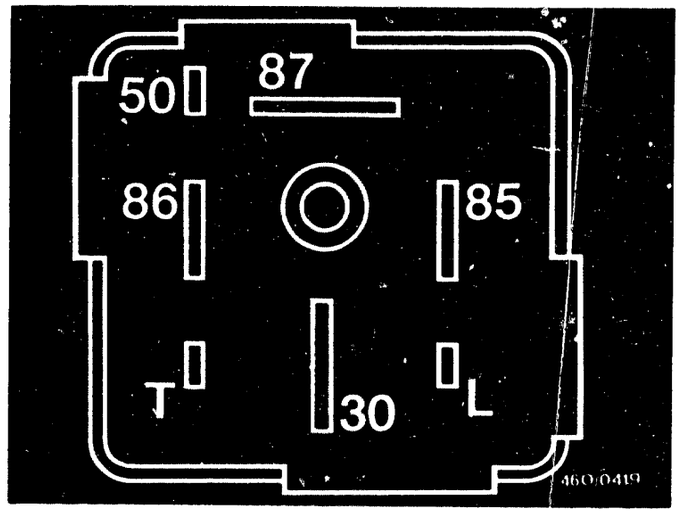
- Connect test lamp to relay terminal 86.
- Turn ignition key to pre-heating.

Test lamp lit?

No → Repair connection from relay plate to terminal 86 of relay or replace relay plate (no voltage on R 15)

Yes ↓

Repair connection from terminal 85 of relay to ground or replace relay.



Pre-heating control relay
T = Temperature sensor
L = Repeater lamp

Note:
If engine starts poorly, also check the functions of the automatic afterheating and the heating during starting.

1. There must be voltage across the glow plugs for a further 6 to 7 seconds after the end of the temperature-dependent pre-heating time (repeater lamp goes out). Do not switch on starting motor for this test. If there is no voltage across the glow plugs, replace pre-heating control relay.
2. There must be voltage across the glow plugs while starting (starting motor switched on). If there is no voltage across the glow plugs, repair the lead from pre-heating control relay terminal 50 to starting motor, or replace pre-heating control relay.

Test pre-heating repeater lamp

Test light-emitting diode

- Remove pre-heating control relay.
- Connect terminal "L" in the relay base to ground using test lead.
- Switch on ignition.

Pre-heating repeater lamp lit?

No → Light-emitting diode defective - replace.

Test lead from relay terminal L to light-emitting diode for continuity.

Yes ↓

Pre-heating control relay and/or engine-temperature sensor defective.
Test operation of relay (see note above)

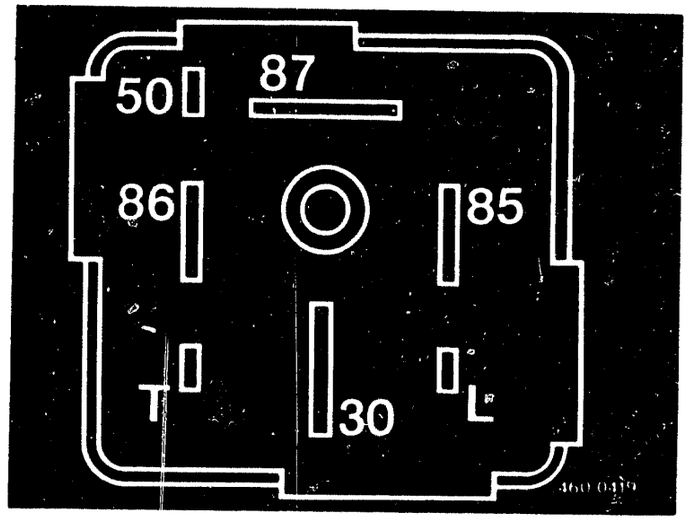
- Remove lead for glow plugs.
- Remove lead frome engine-temperature sensor and allow to hang in air.
- Switch on ignition. Repeater lamp must light up for approx. 25 - 30 sec.
- Connect lead from engine-temperature sensor to ground: repeater lamp must go out.

Light-emitting diode lit?

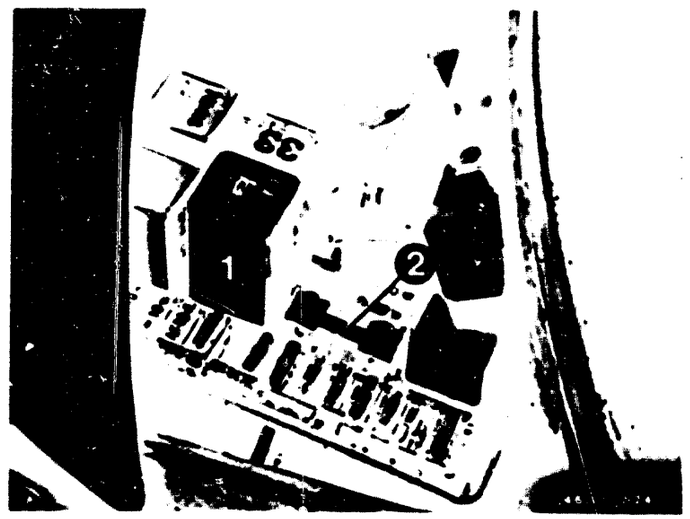
No → Replace pre-heating control relay.

Yes ↓

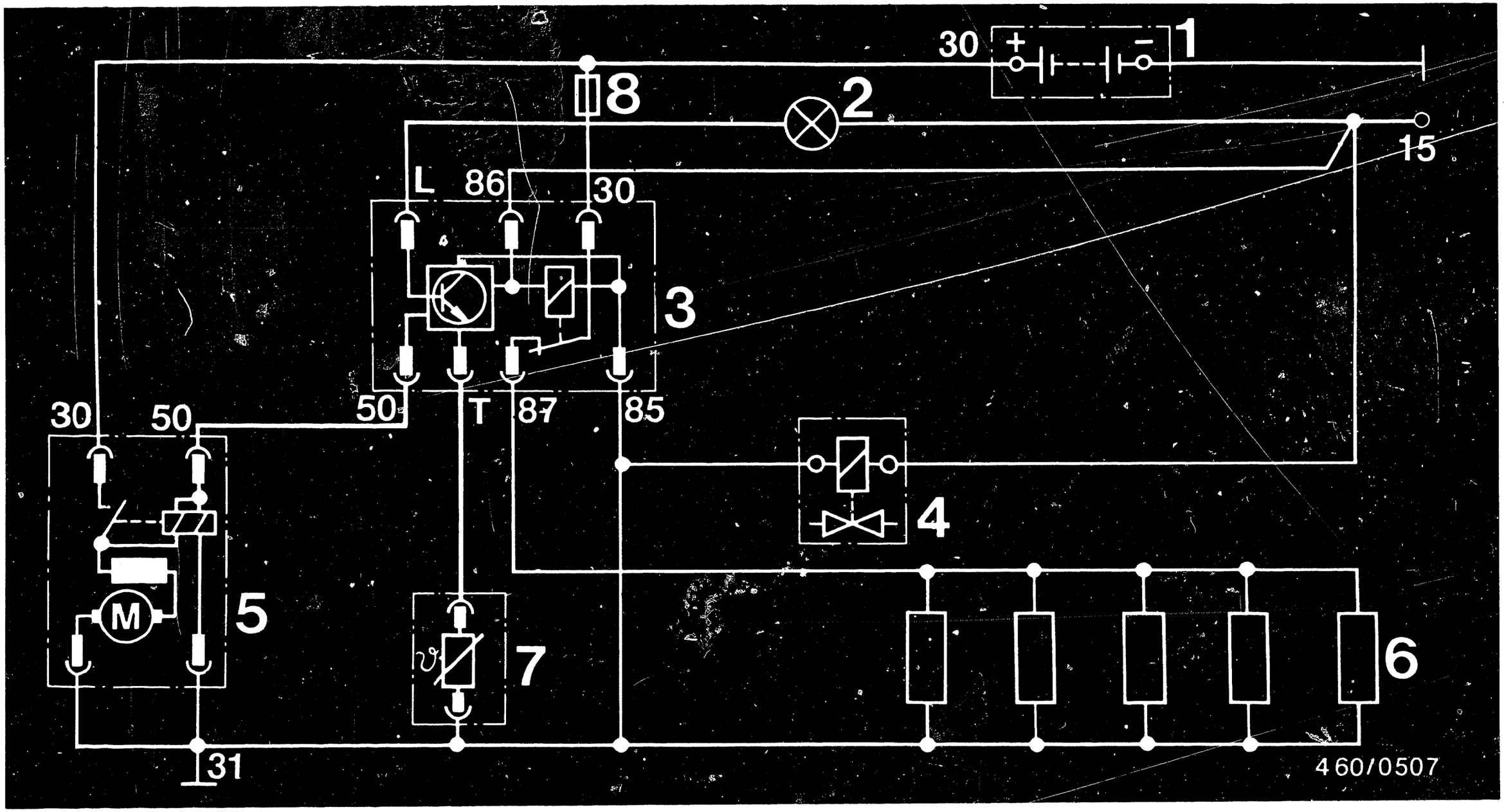
Replace engine-temperature sensor.



Pre-heating control relay
T = Temperature sensor
L = Repeater lamp

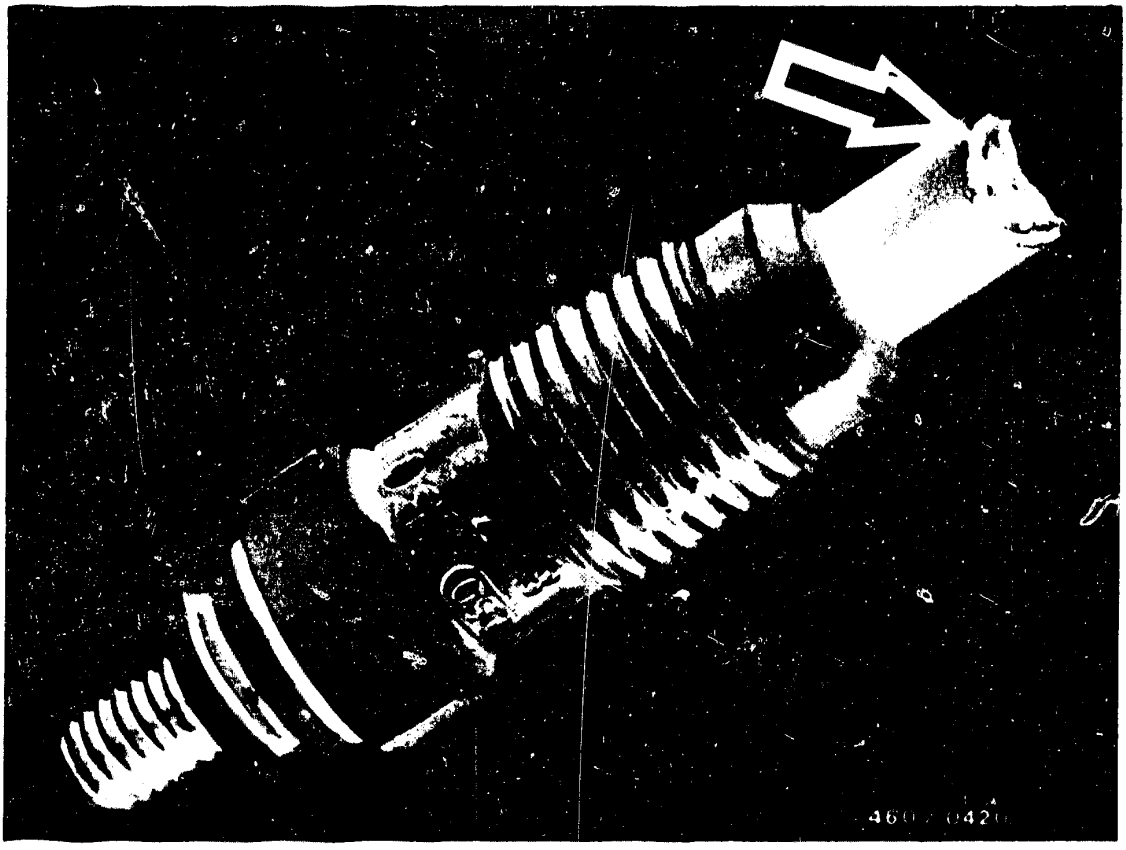


1 = Pre-heating control relay
2 = Fuse 80 A
Mounted in engine compartment left side



1 = Battery
2 = Visual indicator
3 = Glow-duration unit
4 = Solenoid-operated valve
5 = Starting motor
6 = Sheathed-element glow plugs
7 = Temperature sensor
8 = Fuse 80 A

21.3 Terminal diagram for preheating system



Note:

Glow plugs with burned elements

Glow plugs with burned elements are frequently the result of troubles with the injection nozzle.

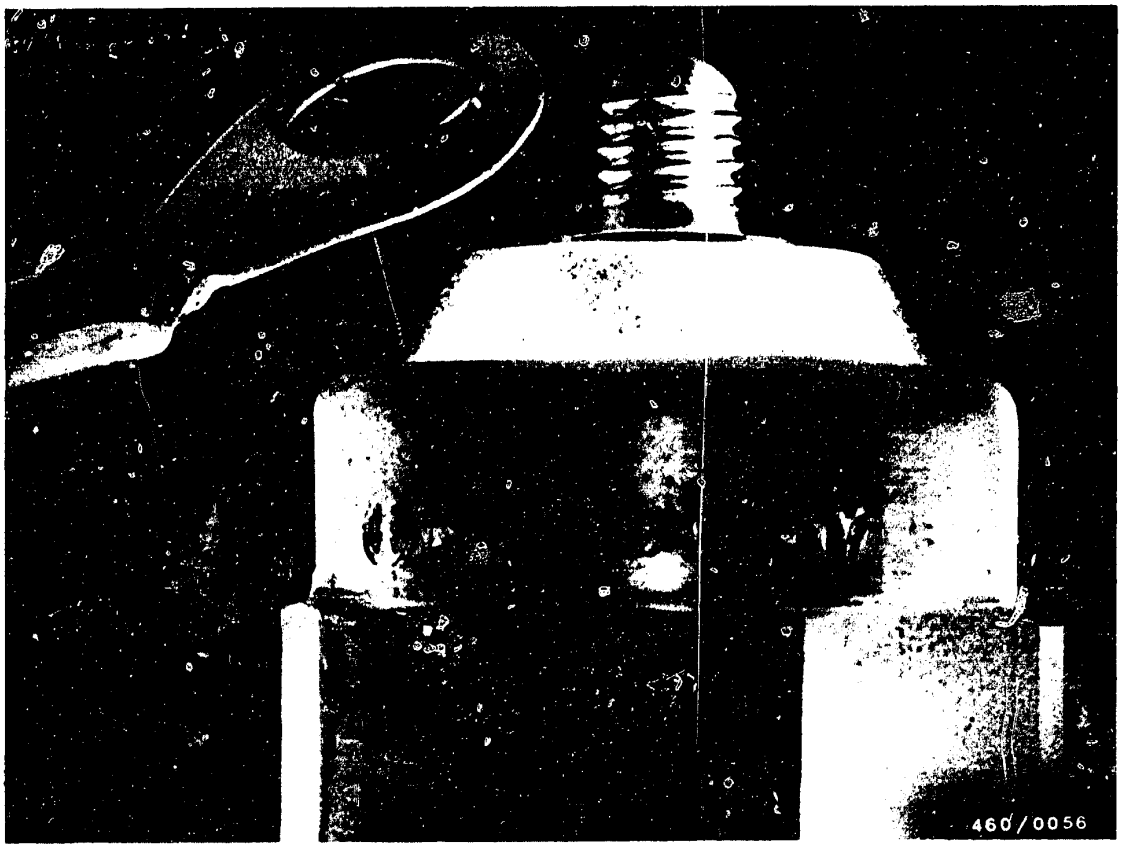
If glow plugs are found to have burned elements (arrow), it is not sufficient simply to replace them. The injection nozzles must also be tested for spray pattern, chattering, pressure and leaks.

22. Check timing device

In distributor-type fuel-injection pumps VE..F.. the timing device is integral with the fuel-injection pump.

In order to test the timing device, it is necessary to remove the fuel-injection pump.

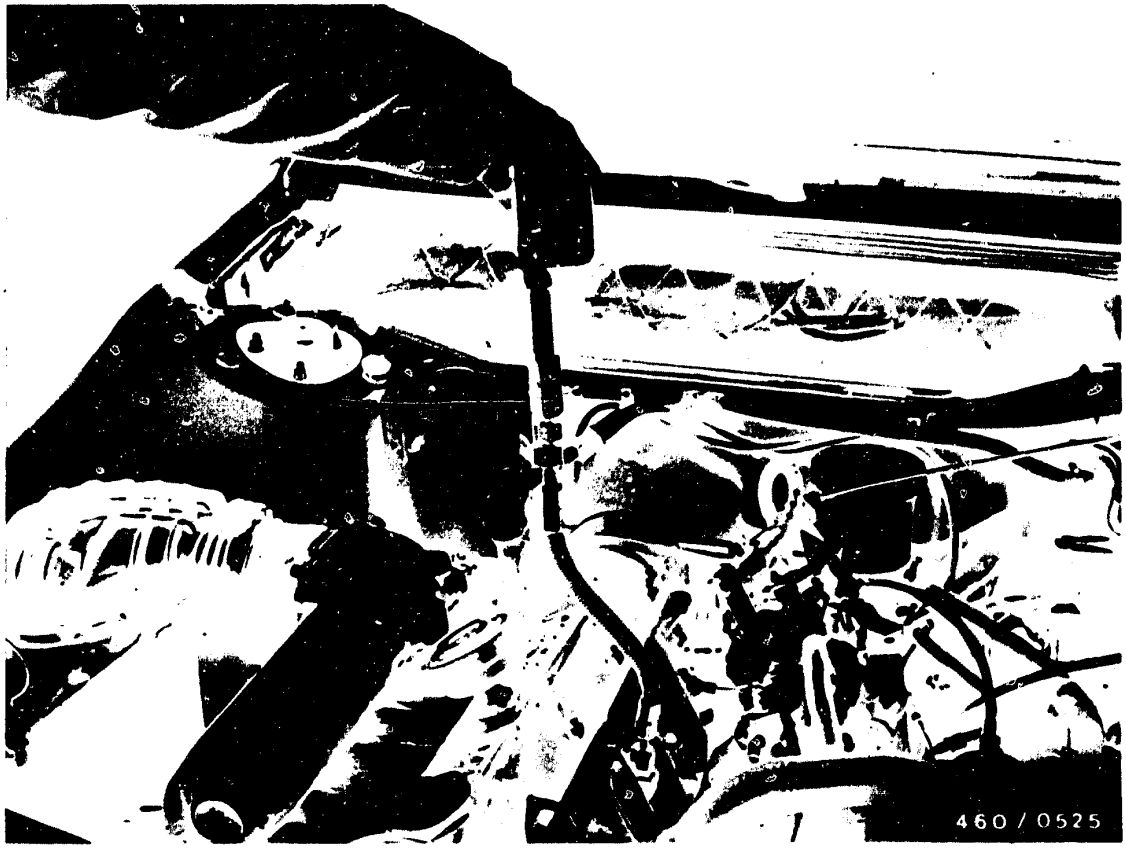
Perform the test on the injection-pump test bench.



23. Measure engine compression and compression loss

23.1 Measure engine compression

Fit new chart in compression tracer. Mount high-pressure hose on tracer. Switch off engine.
In order to prevent fuel from being injected, remove connecting cable from shutoff magnet on distributor-type fuel-injection pump (picture).



Screw out nozzle holder and use suitable connection nipple for compression tester.

With the aid of the starting motor, turn the engine over several times so that loose residues are removed from the compression space.

Screw in connection nipple.
(Ensure good sealing when screwing into the bore of the nozzle holder).

Mount high-pressure hose of compression tester on connection nipple.

During the following operation, note first compression stroke.

Operate starting motor until there is no longer any detectable rise in pressure on the compression tracer.

Bleed compression tracer by pressing on bleeder valve.

The pointer returns to the starting position.

Move chart onto next position.

Fit connection nipple to the other cylinders and repeat measurement.

Compression pressure:	28 ... 34 bar
Allowable difference between cylinders:	max. 5 bar

23.1.1 Evaluation of chart

1. Normal pressure rise

If piston rings and valves are in good condition, the first compression stroke shows the highest pressure increase.
During the following compression strokes the compression builds up to the maximum pressure.

2. Gradual pressure rise

If, from the start, the compression increases only gradually on each piston stroke, this points to burnt valve seats or defective valve guides.

3. Low maximum pressure

If the maximum pressure obtained is too low on all cylinders, this points to defective pistons, piston rings or valves.
If the compression is too low on two neighbouring cylinders, this points to a leaky cylinder head gasket.

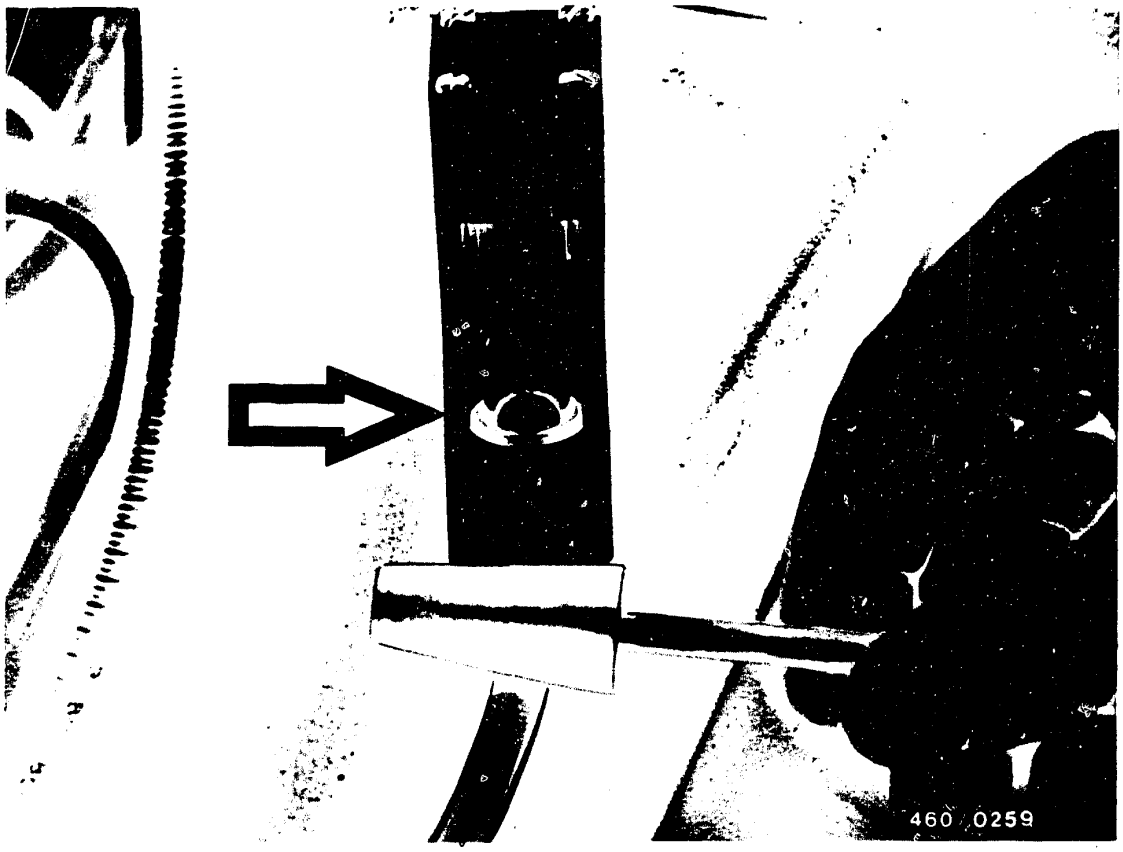
4. Varying compression

If one cylinder shows a clearly lower compression, proceed as follows: fill in 2-3 cm^3 of engine oil through the opening of the sheathed-element glow plug or nozzle-holder assembly and operate starting motor briefly.

Repeat measurements and compare charts. If there is a clear increase in compression during the second test, then the piston rings or cylinders are worn.
If there is no change in the result, then defective valves are the cause.

5. Uniform compression

Uniform compression is extremely important with regard to the smooth running of the engine. Maximum compression is, therefore, not the only objective.



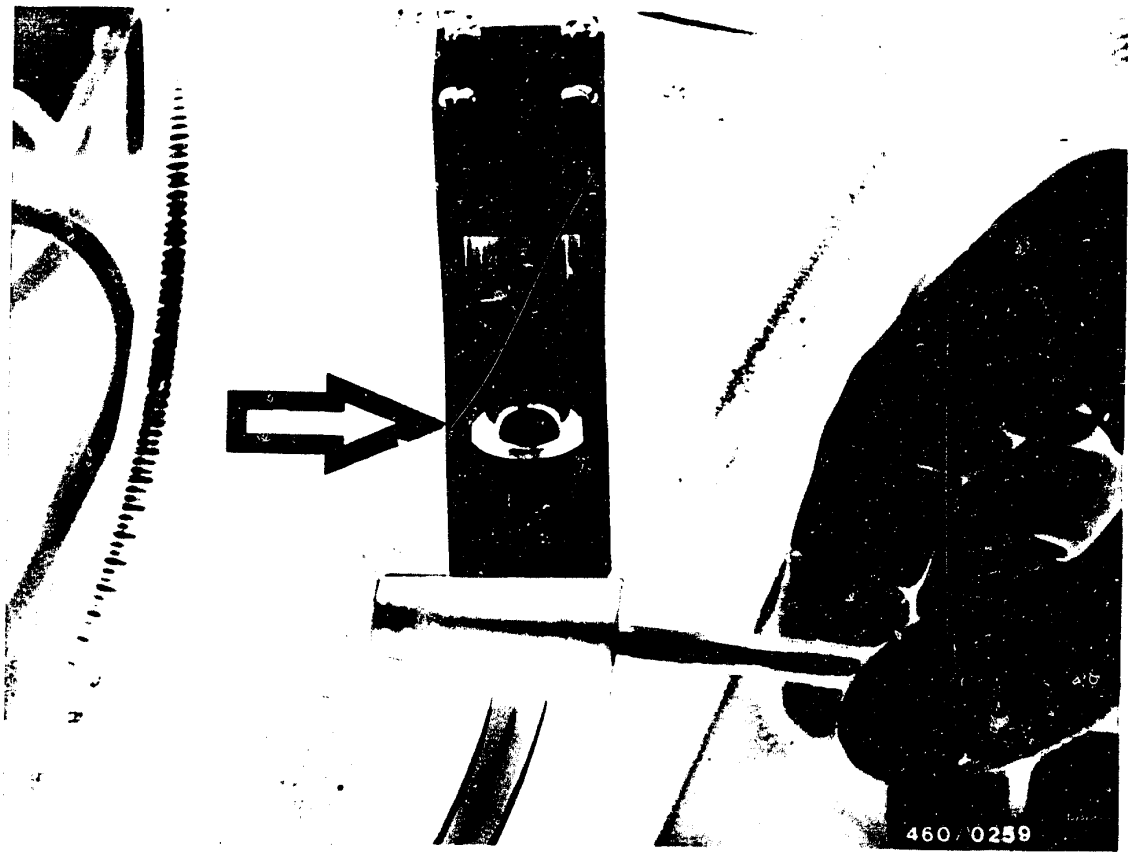
23.2 Measure compression loss of engine

The test is performed using the Bosch compression-loss tester 0 681 001 901 (EFAW 210 A).

For testing, the respective piston must be at TDC (TDC = top dead centre) on the compression stroke.

For setting this position, use DC detector 1 688 132 025 (included in accessories with compression-loss tester).

Perform test with engine at normal operating temperature (temperature of water approx. 80 °C).



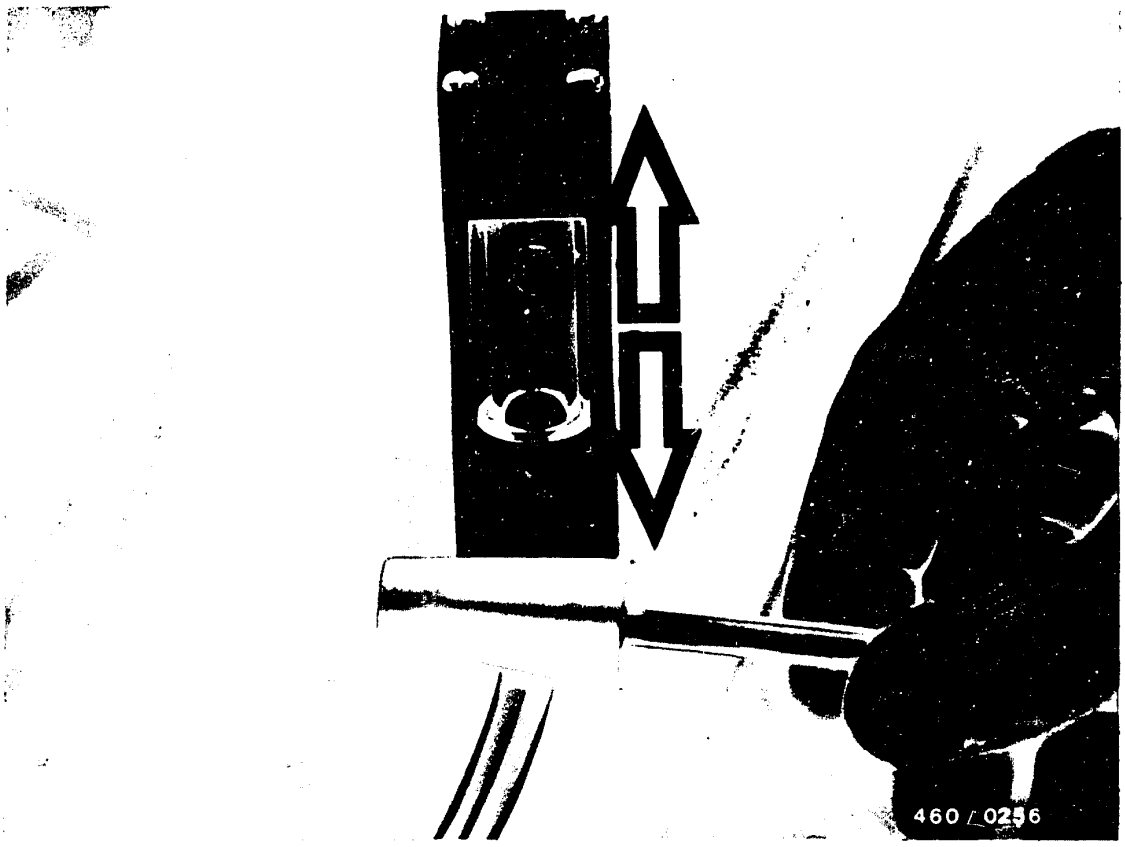
23.2.1 Set top dead centre

Remove sheathed-element glow plug from cylinder 1.

Insert rubber plug of DC detector into bore for sheathed-element glow plug.

Using magnetic clamp, mount glass cylinder in as vertical a position as possible in the engine compartment. The piston of the unit must be easily visible.

Slowly turn the engine over by hand in its direction of rotation. (If necessary, select gear and push vehicle).



On the compression stroke, the piston of the DC detector is forced upwards.

As top dead centre is passed over, the piston slides down again immediately.

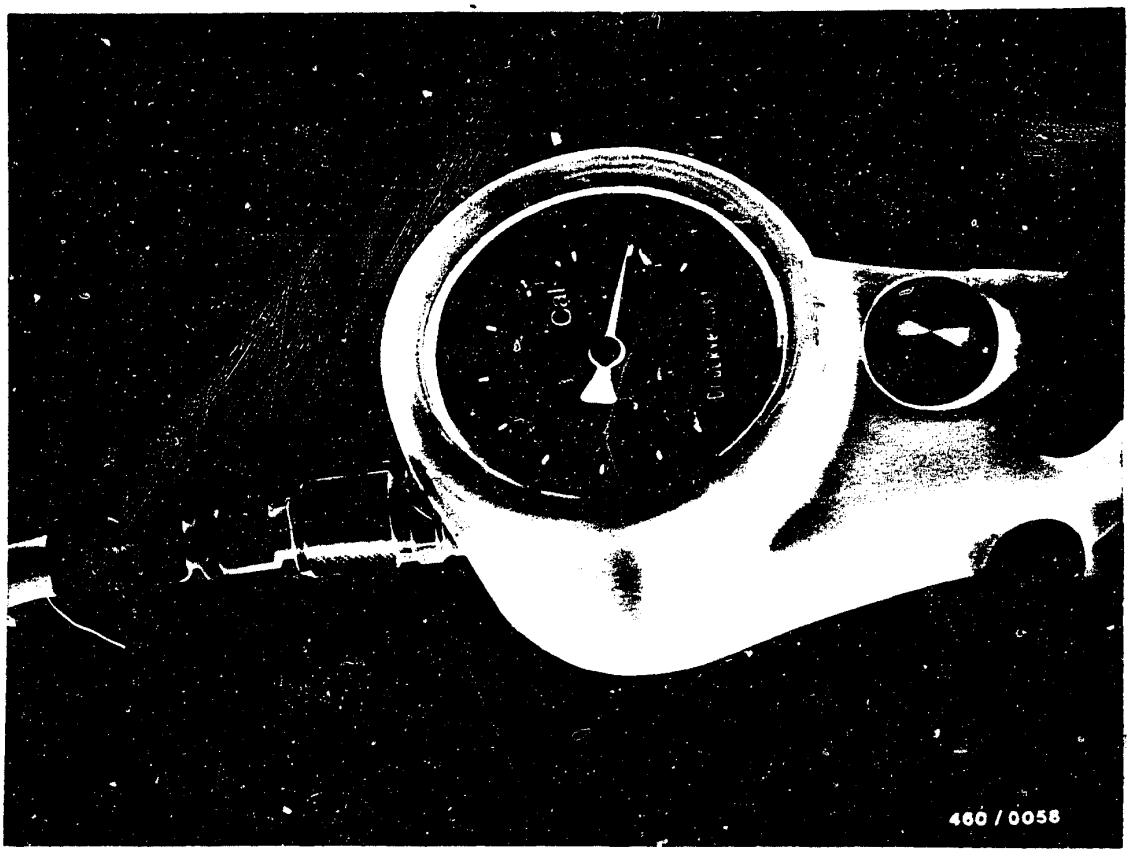
Locate top dead centre by carefully turning the engine backwards and forwards.

23.2.2 Measure compression loss

Connect tester to compressed-air mains.

Connect calibrating nozzle 1 680 363 036. Set a compression loss of 23 ± 1% (marking "Cal".) at the knurled thumbscrew on the pressure-regulating valve. Disconnect calibrating nozzle.

(Instrument indicator must show approximately 0% compression loss - equipment check.)



Screw in fitting and mount test hose.
Select gear and pull on handbrake.
Connect test hose to tester.
Read off compression loss in % on instrument.

Note:
Before testing the next cylinder, turn the engine over briefly without pre-heating using the starting motor so that the oil film re-forms.

23.2.3 Evaluation of test

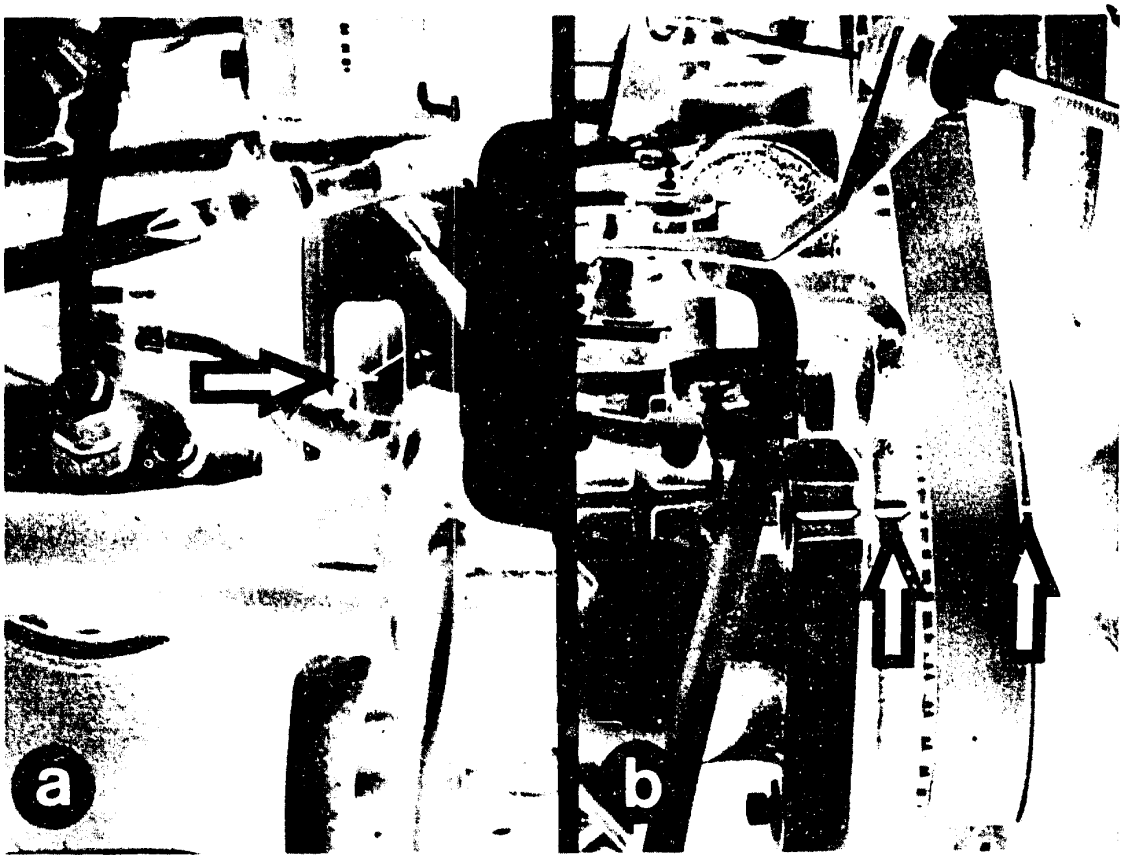
The compression loss indicated should not exceed 25%.

Differences of 10% between the individual cylinders can be ignored.
The causes of greater losses can be located because the air makes a noise as it escapes.
Listen at the following points:

Location of noise	Possible trouble
Intake manifold (remove air filter)	Intake valve
Exhaust manifold	Exhaust valve
Oil filler neck on engine	Pistons, piston rings
Cooling water filler neck (air bubbles)	Cylinder head gasket

In order to trace the trouble even more accurately, fill approximately 2-3 cm^3 of engine oil into the cylinder.
Repeat test.
If there is a clear decrease in compression loss during this test, then the fault lies with the piston or with the piston rings.

New engines which have not yet been run in (less than 5,000 km) may show higher compression losses than after the running-in period.



24. Remove fuel-injection pump

Disconnect negative terminal of battery.

Remove toothed-belt guard for injection-pump drive.

Turn the crankshaft so that cylinder 1 is at TDC (picture a).

Marks between flywheel and clutch housing as well as injection-pump gear and bracket must be in alignment (picture b).

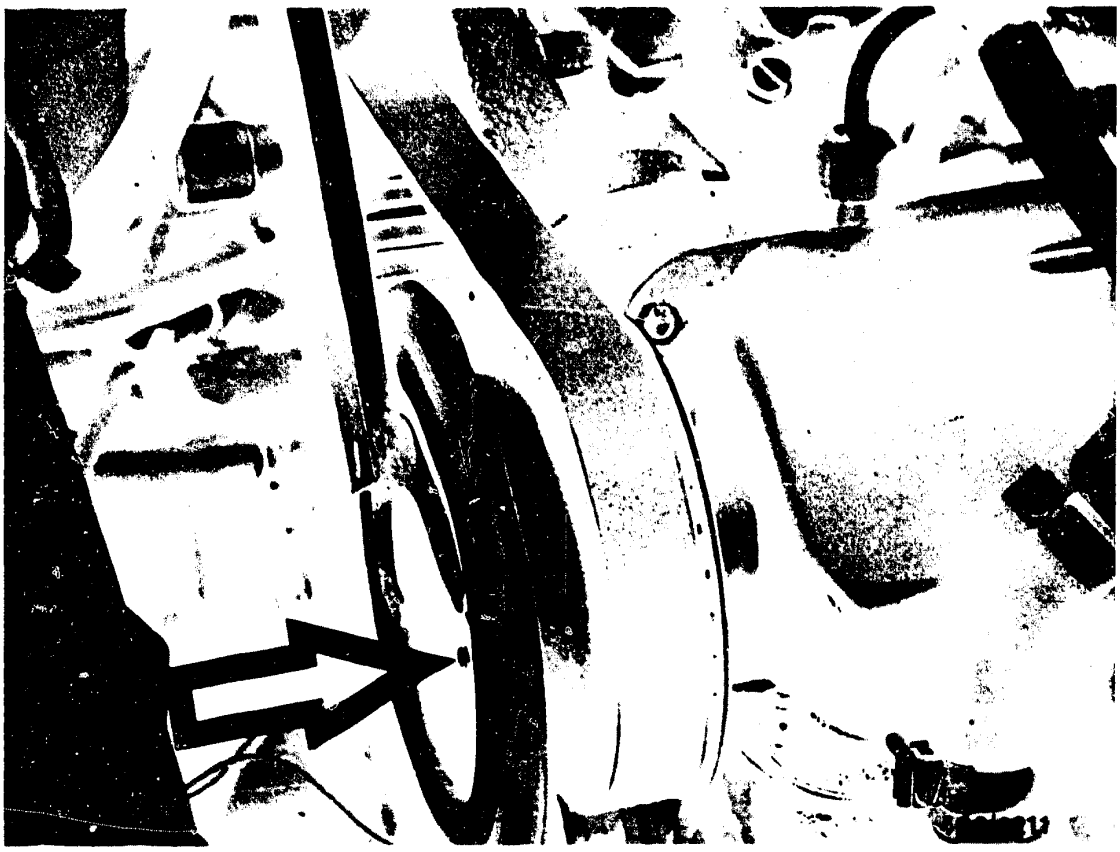
Lock injection-pump gear using setting mandrel KDEP 1122.

Note:

Only for Audi 100 5 D (up to 8.82):

Remove hexagon nuts of pulley (arrow) with spring lock washers.

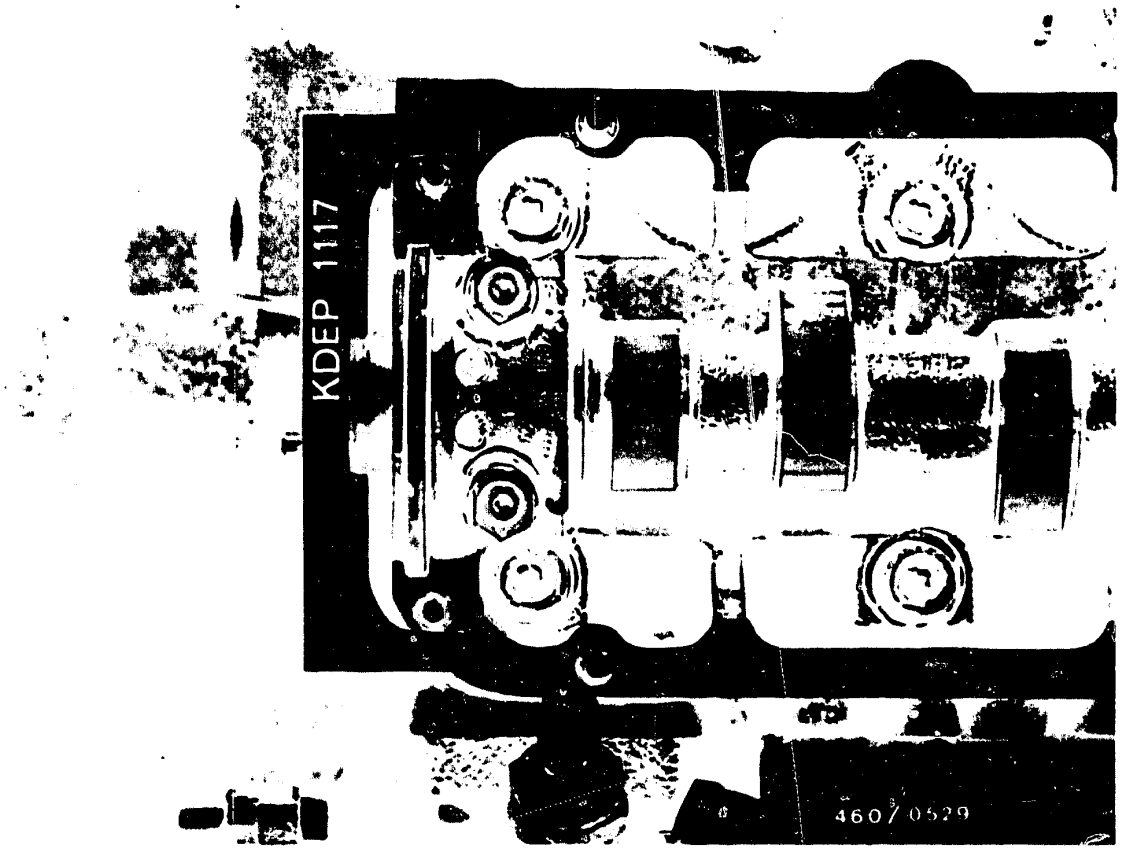
Remove front half of pulley and V-belt.



Lock camshaft gear using holder KDEP 1116.

Loosen fastening screw (arrow) and screw out.

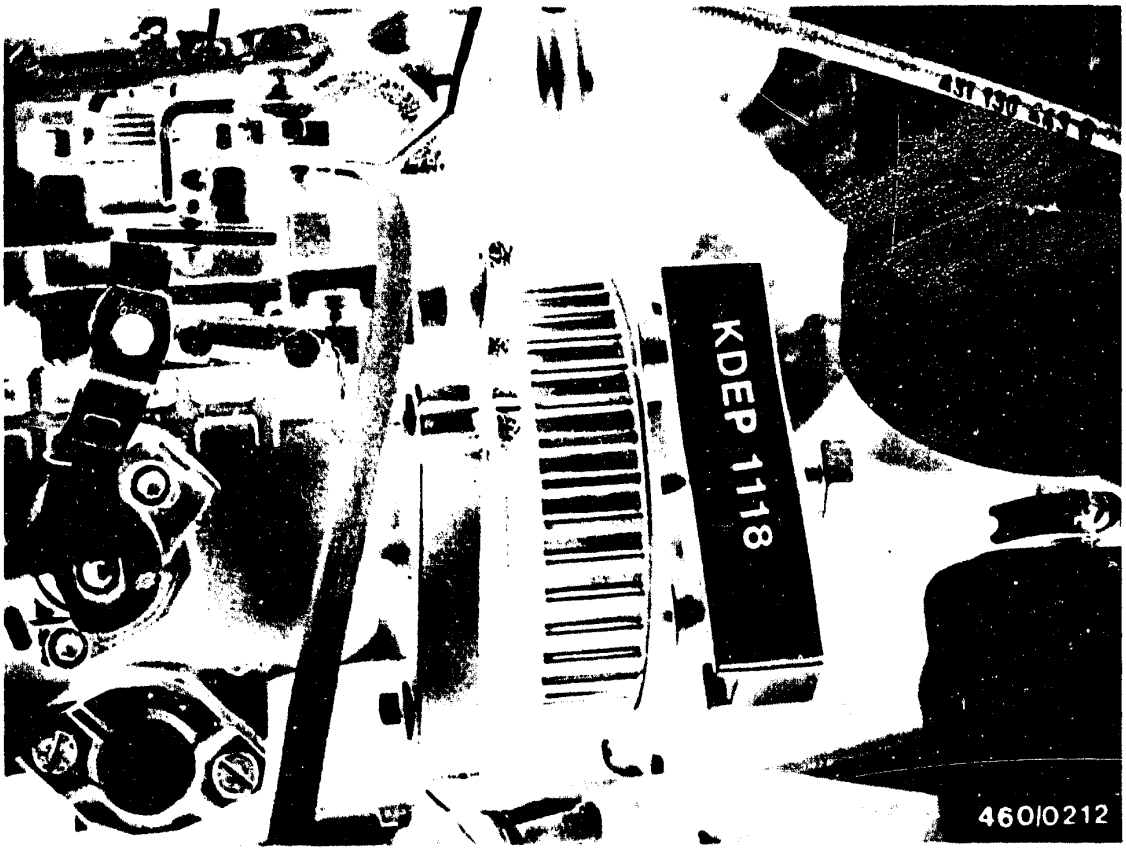
Remove camshaft gear with toothed belt and pulley half from engine camshaft.



Remove cylinder head cover.

Insert setting rule KDEP 1117 into camshaft recess.

If the setting rule cannot be introduced, the engine timing must be corrected.



Loosen injection-pump gear fastening nut by one turn.

Mount puller KDEP 1118 on pump drive gear.

Pull off pump drive gear.

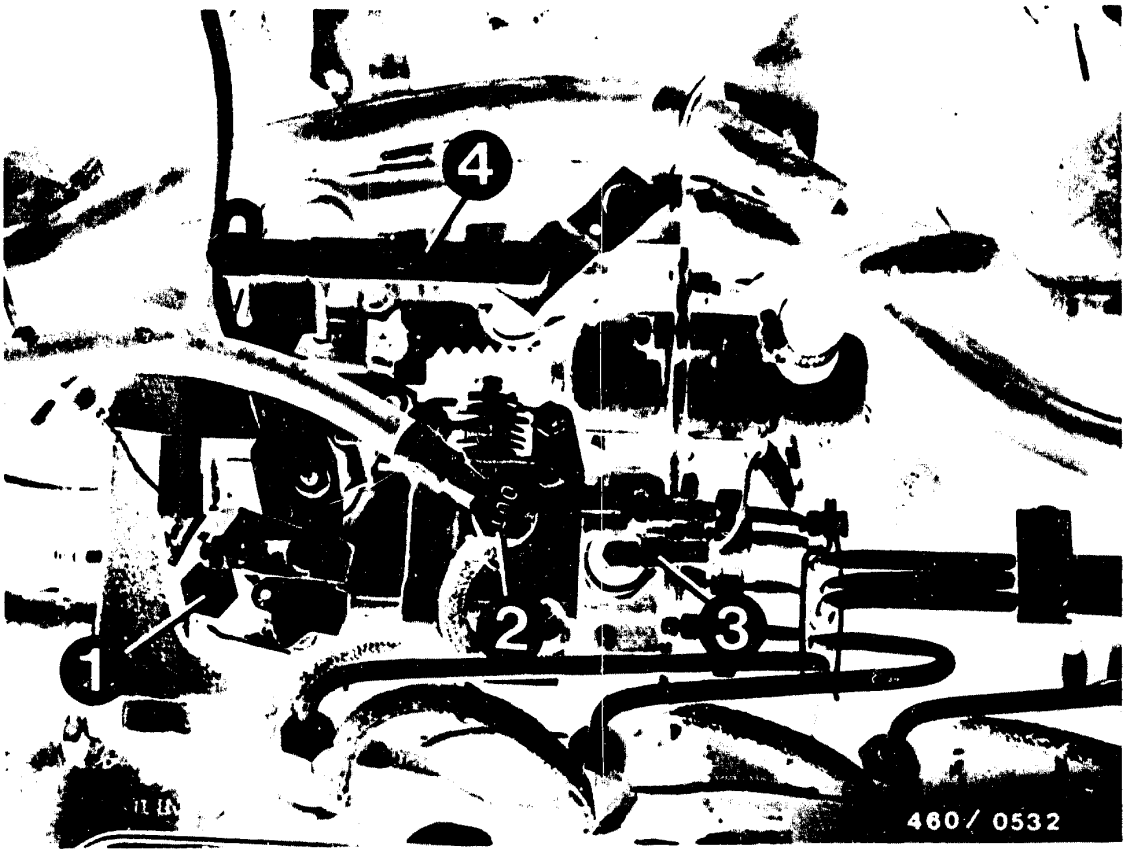
Remove puller KDEP 1118.

Unscrew fastening nut and remove injection-pump drive gear with setting mandrel.

Loosen fuel-injection lines using open box wrench KDEP 1115.

Caution!

Prevent the delivery-valve holders from coming loose by holding with a wrench.

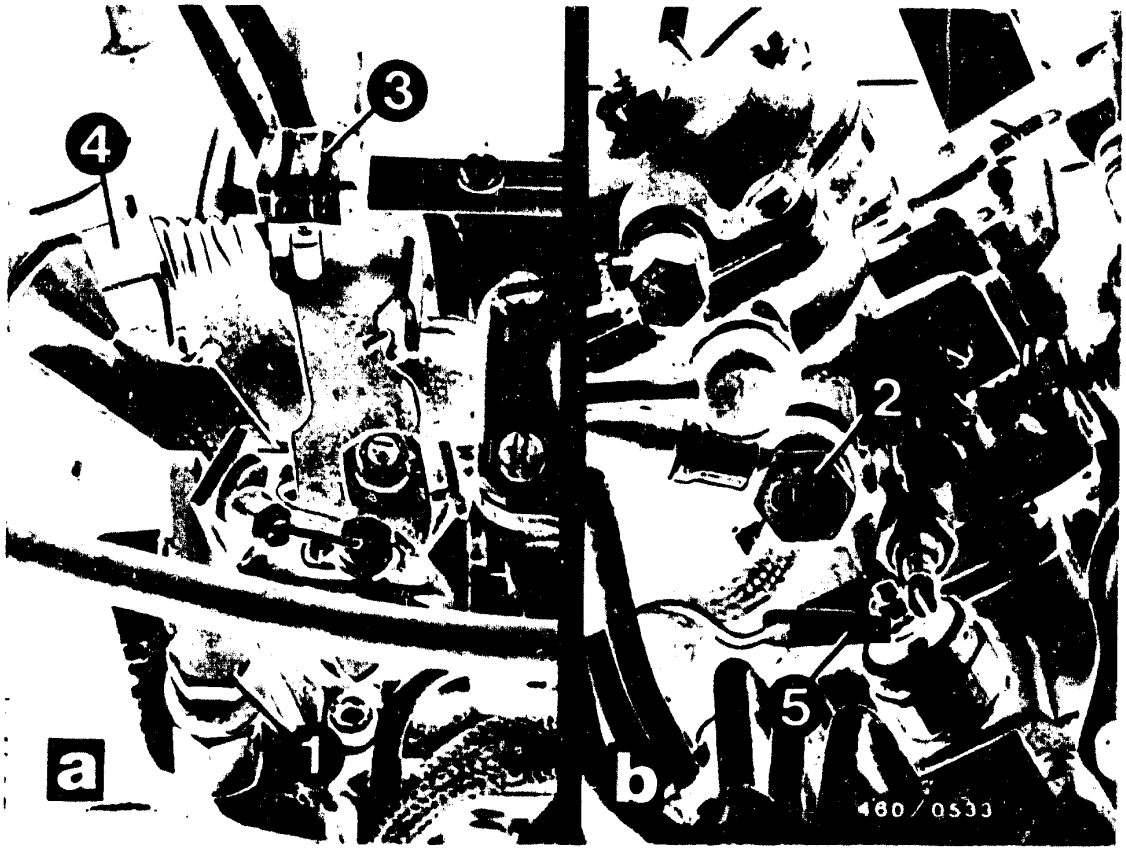


AUDI 100 5 D:

Remove fuel inlet line (1) and return line (2) from injection pump.

Remove cable for electric shutoff device (3).

Remove connection (from accelerator) from control lever (4).

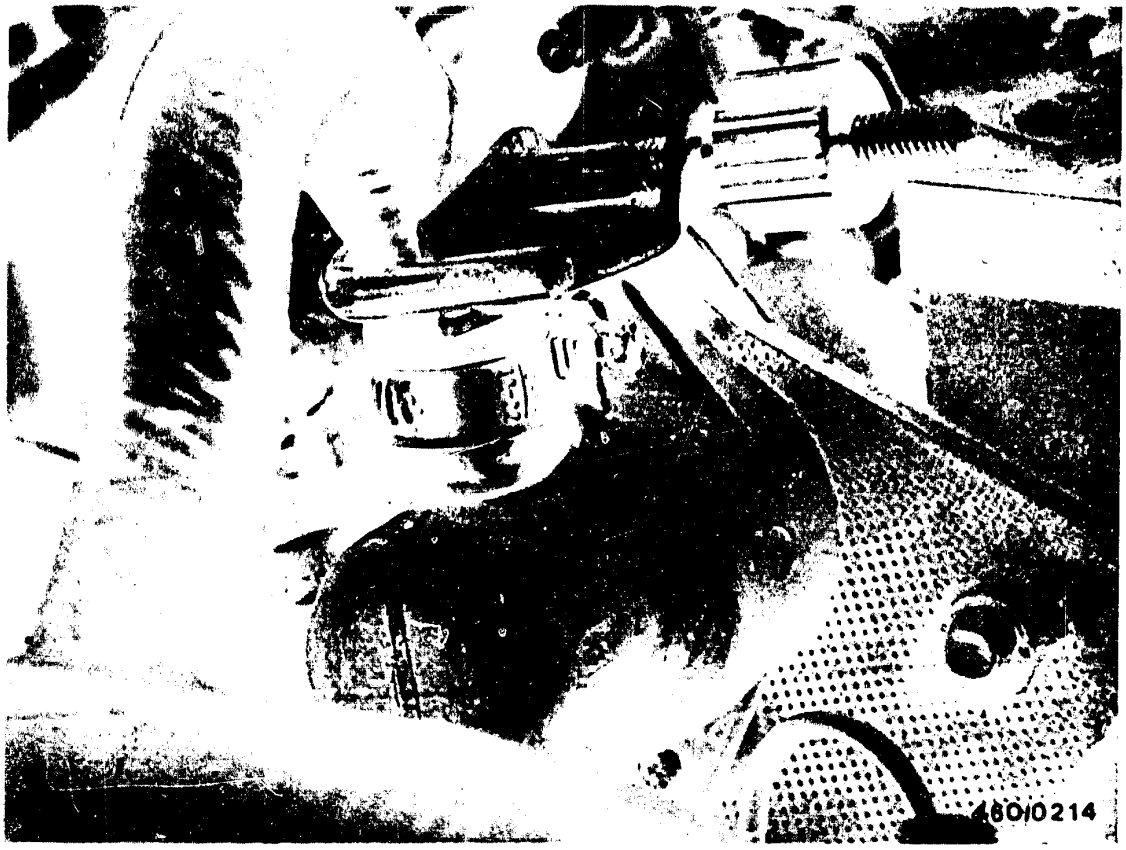


AUDI 100 5 D - Turbo:

Remove fuel inlet line (1) and fuel return line (2) from injection pump.

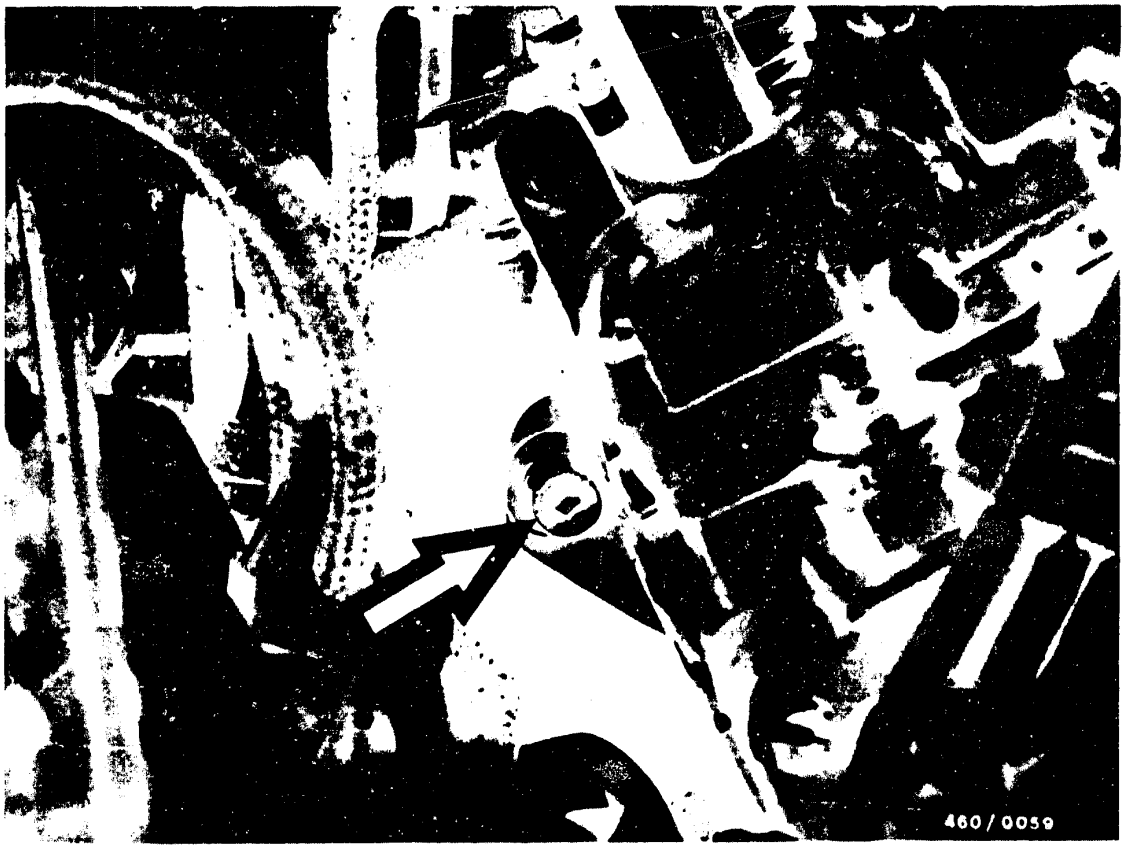
Remove connection (from accelerator) from control lever (3).

Remove connector (4) from gear-shift indicator sensor and remove cable for electric-shutoff device (5).



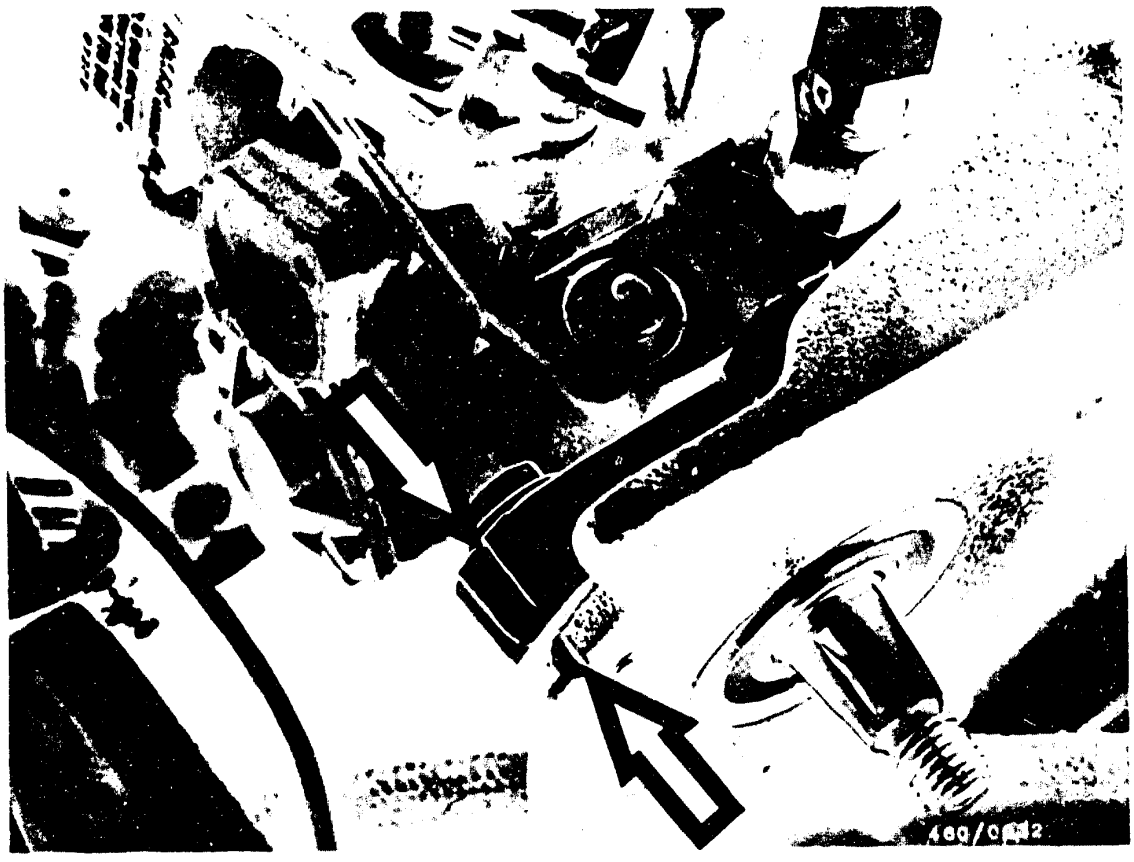
Using commercially available hose clampers, pinch off cooling-water hoses just after injection-pump control device.

Loosen hose clips and pull off cooling-water hoses.



For the rear injection-pump fastening screw use socket 220 mm long for 6 mm hex. socket head.

Remove other fastening screws and remove distributor-type injection pump.



25. Install fuel-injection pump

Insert fuel-injection pump so that marks on injection-pump flange and console are in alignment (arrow).

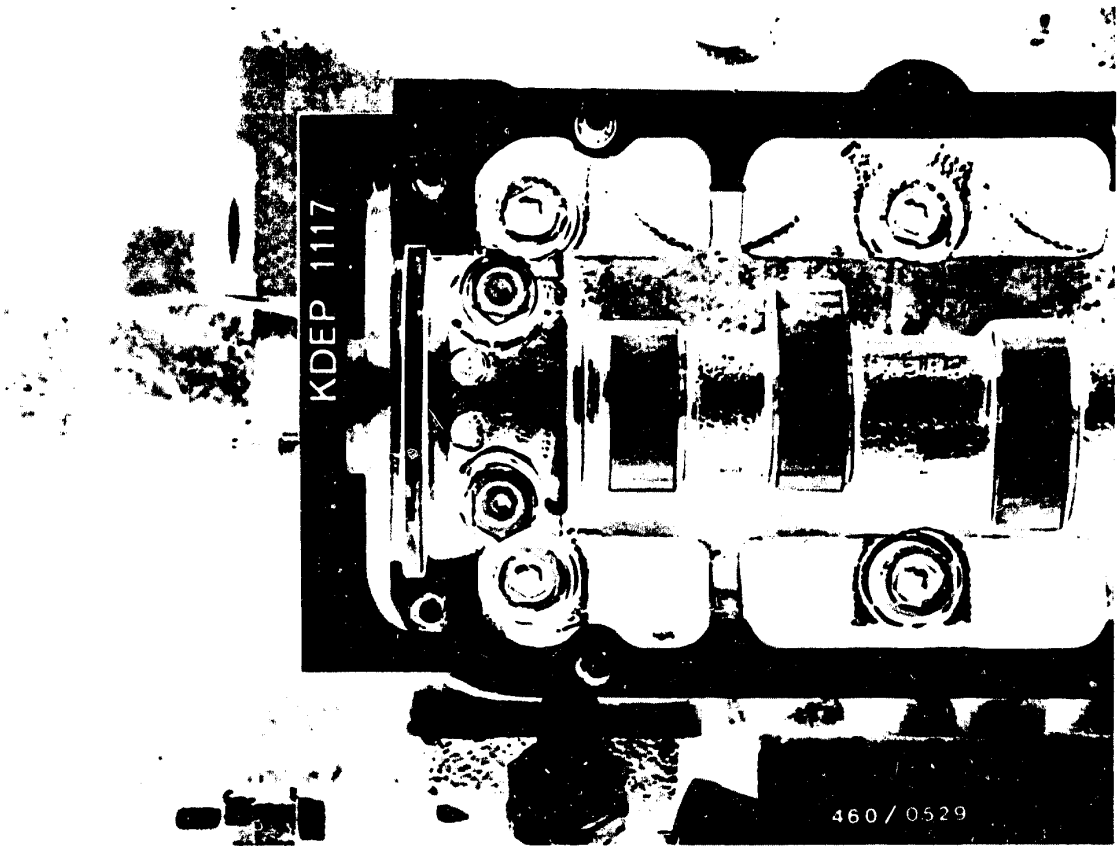
Position injection-pump fastening screws and finger-tighten.
Align support bracket on hydraulic head of injection pump so that it is up against the cylinder block and hydraulic head free of tension.

Screw down the support bracket.

Mount injection-pump gear (Woodruff key in cone of pump drive shaft must be installed) and turn so that notch marks on injection-pump gear and console are in alignment (arrows).

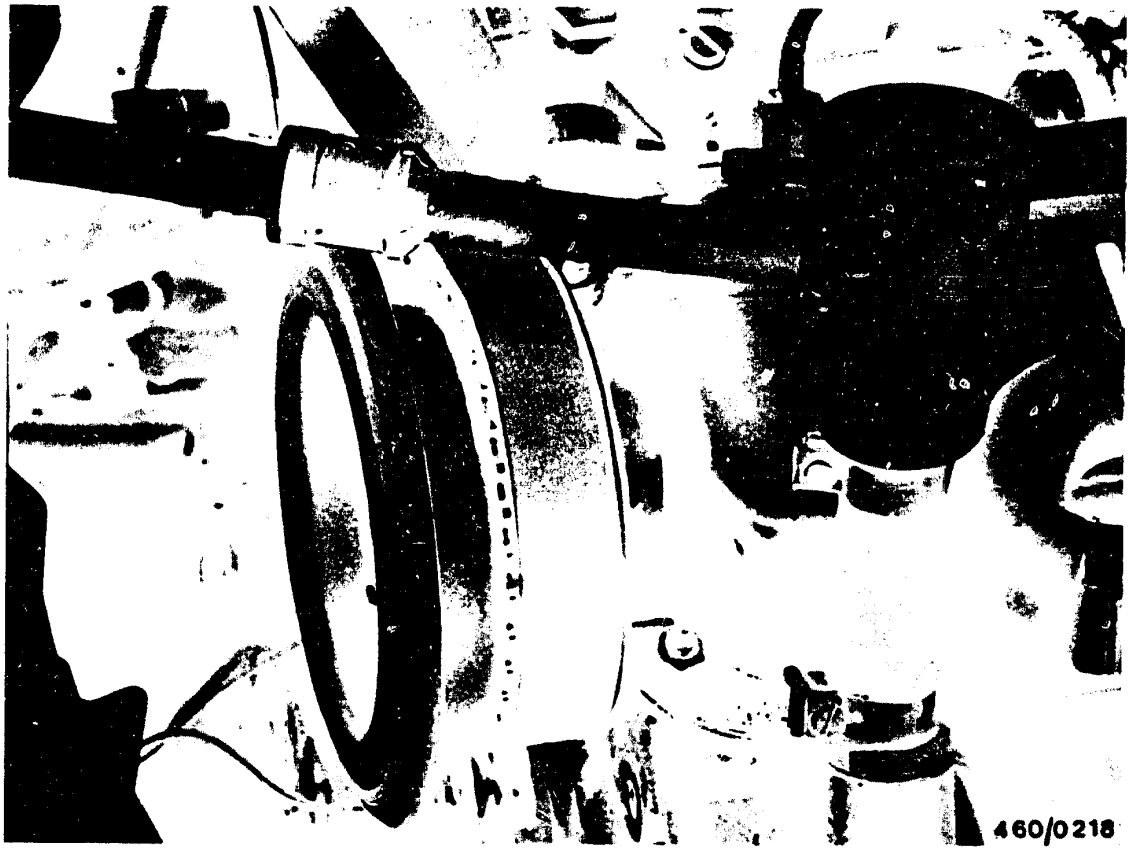
Lock injection-pump gear using setting mandrel KDEP 1122.

Tighten fastening nut to 45 Nm.



Remove setting rule KDEP 1117.

Mount cylinder head cover.



Mount toothed belt with engine camshaft gear.

Only tighten camshaft gear fastening screw so much that it is still possible to move the camshaft gear by hand.

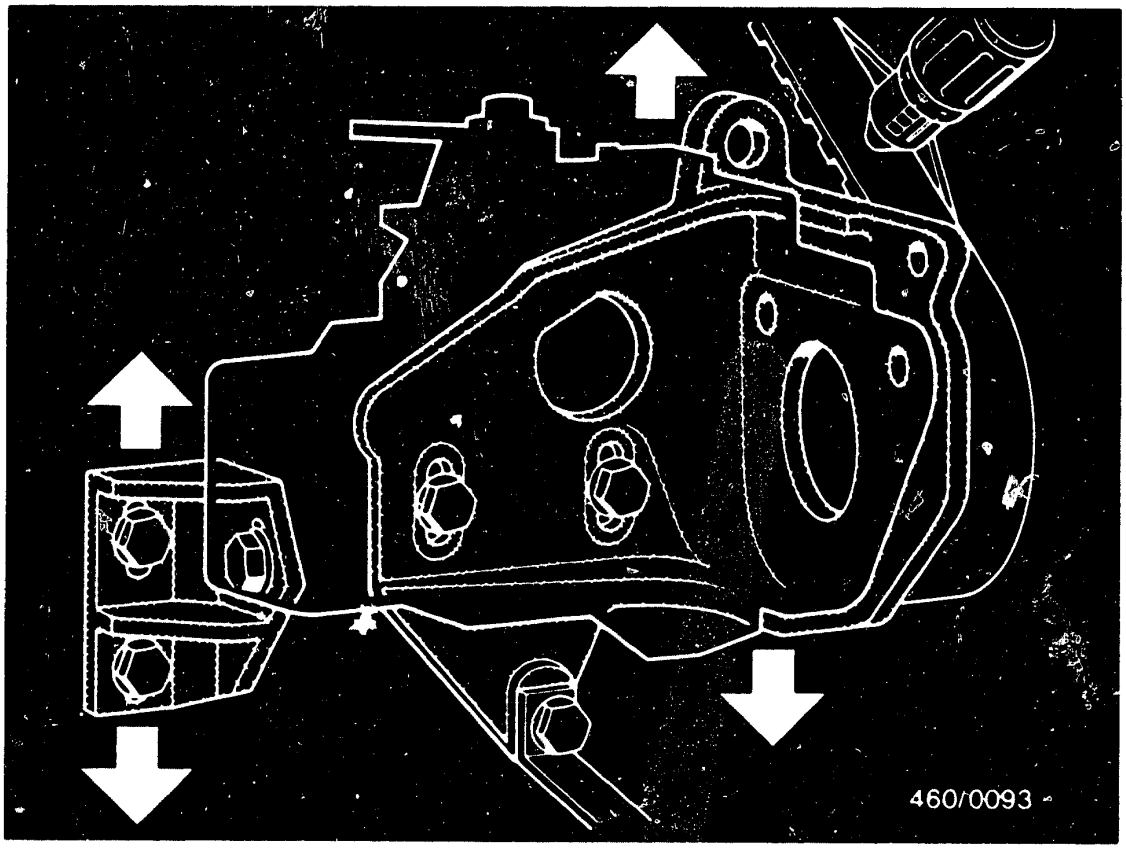
Remove setting mandrel KDEP 1122.

Test tension of toothed belt using belt tension tester KDEP 1121.

Turn vernier sleeve until bottom edge of sleeve aligns with the line mark on the measuring lug.

Make reading:

Set value: Scale value 12...13

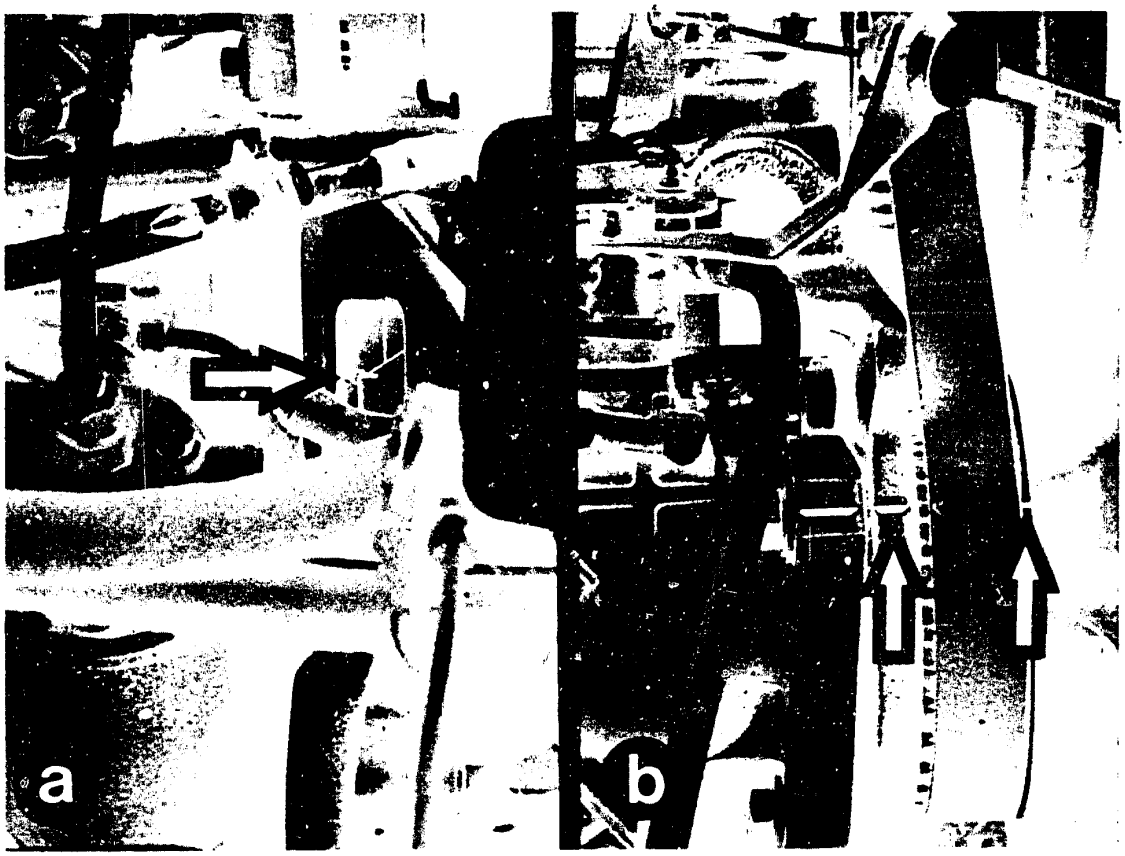


If the measured value differs from the set value, loosen fastening screws of pump bracket and of holding bracket on hydraulic head.

Move injection pump with bracket up or down as required (arrows).

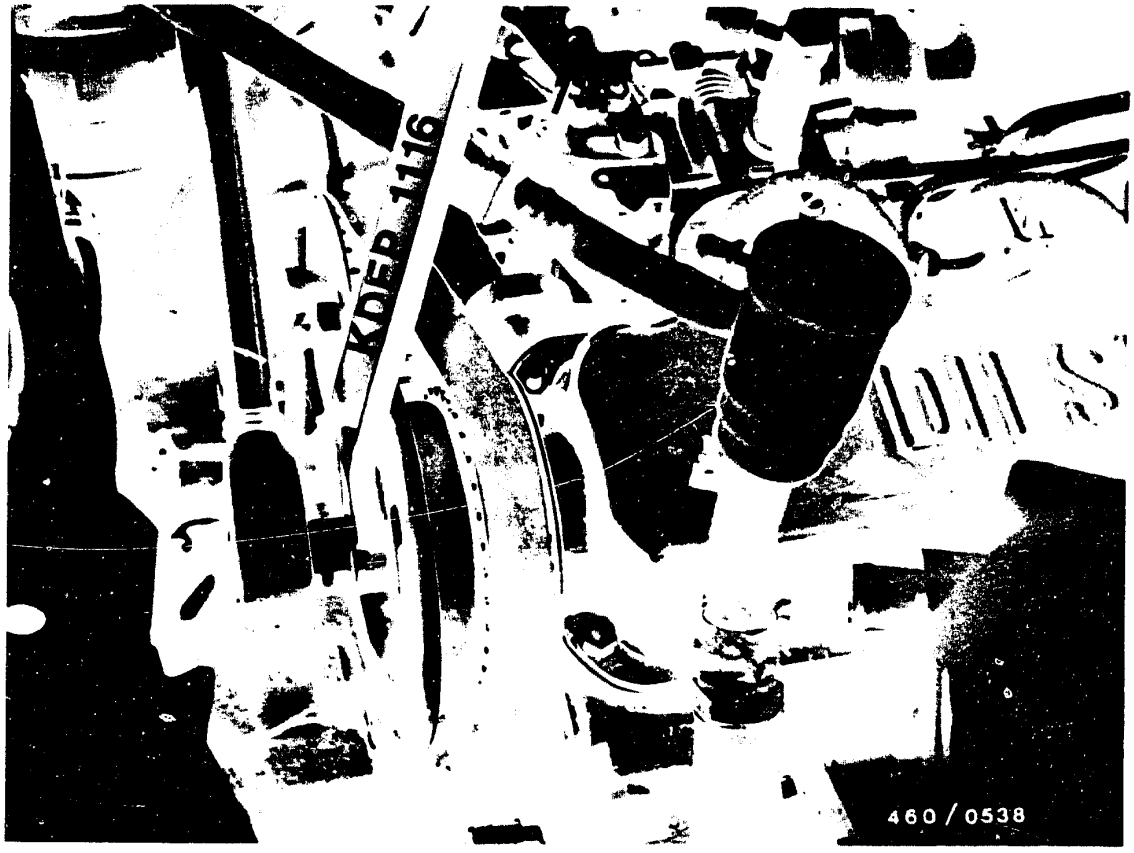
Tighten fastening screws of pump bracket and of holding bracket to 65 Nm.

Turn engine over twice and check tension of toothed belt again.



Check whether the mark between flywheel and clutch housing (picture a) as well as between injection-pump gear and bracket aligns with reference mark (picture b).

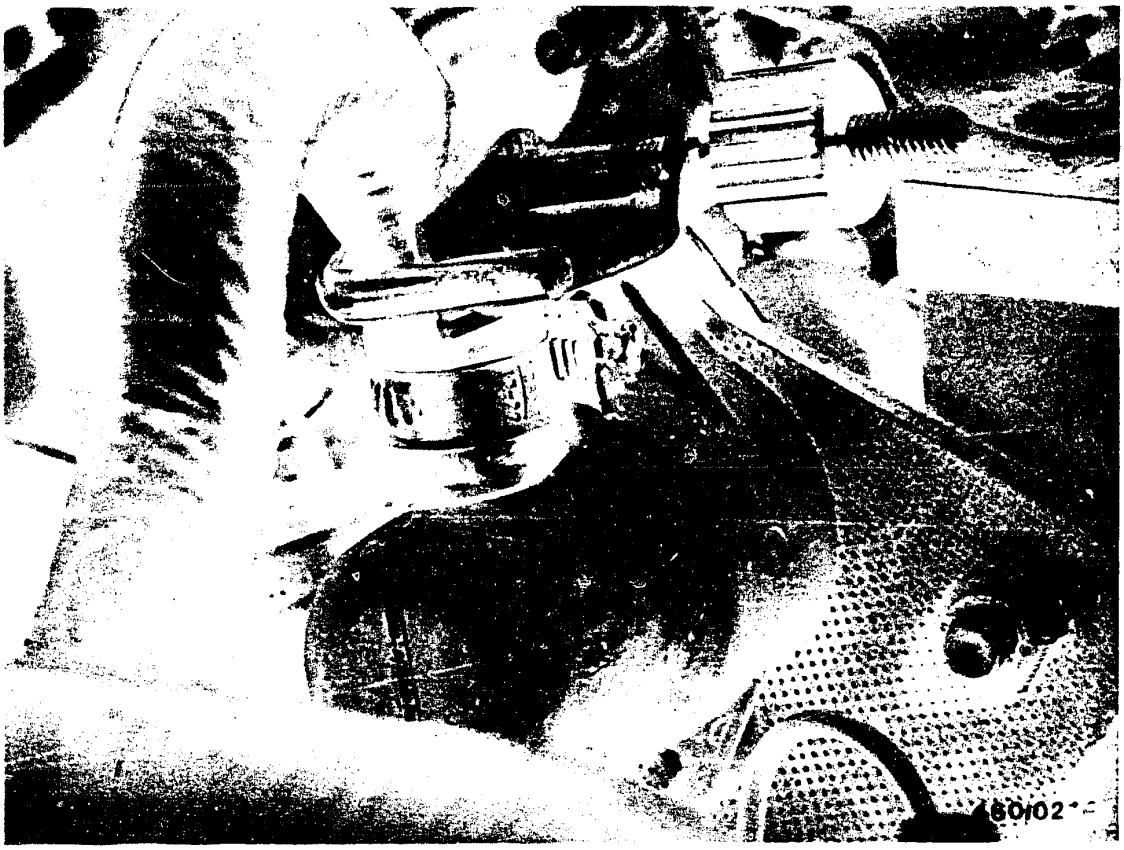
Lock injection-pump gear using setting mandrel KDEP 1122.



Lock camshaft gear using holder KDEP 1116 and tighten fastening screw to 100 Nm.

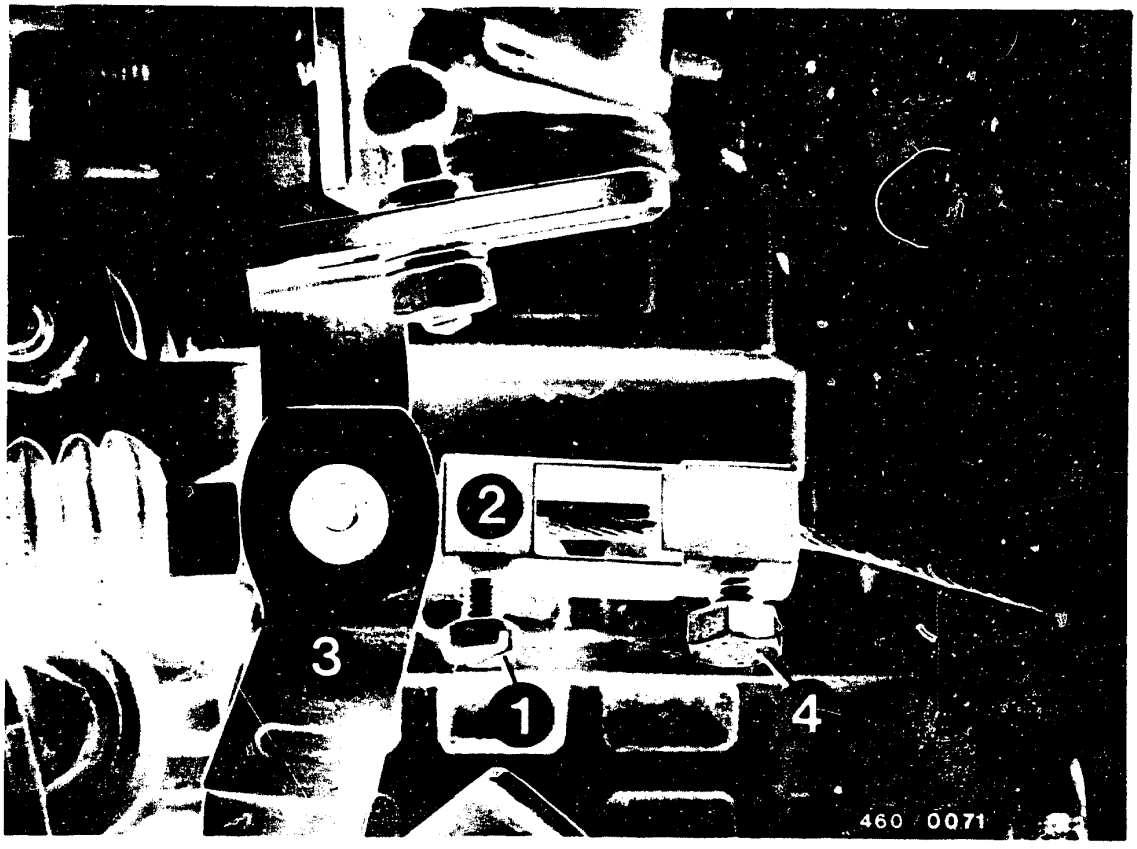
Remove setting mandrel KDEP 1122.

Mount front half of pulley with V-belt (only on Audi 100 5 D up to 8.82).



Connect coolant lines to injection-pump control device and remove hose clampers.

Tighten hose clips.



When testing and setting the start of delivery, the temperature-controlled cold-start accelerator must be in the zero position.

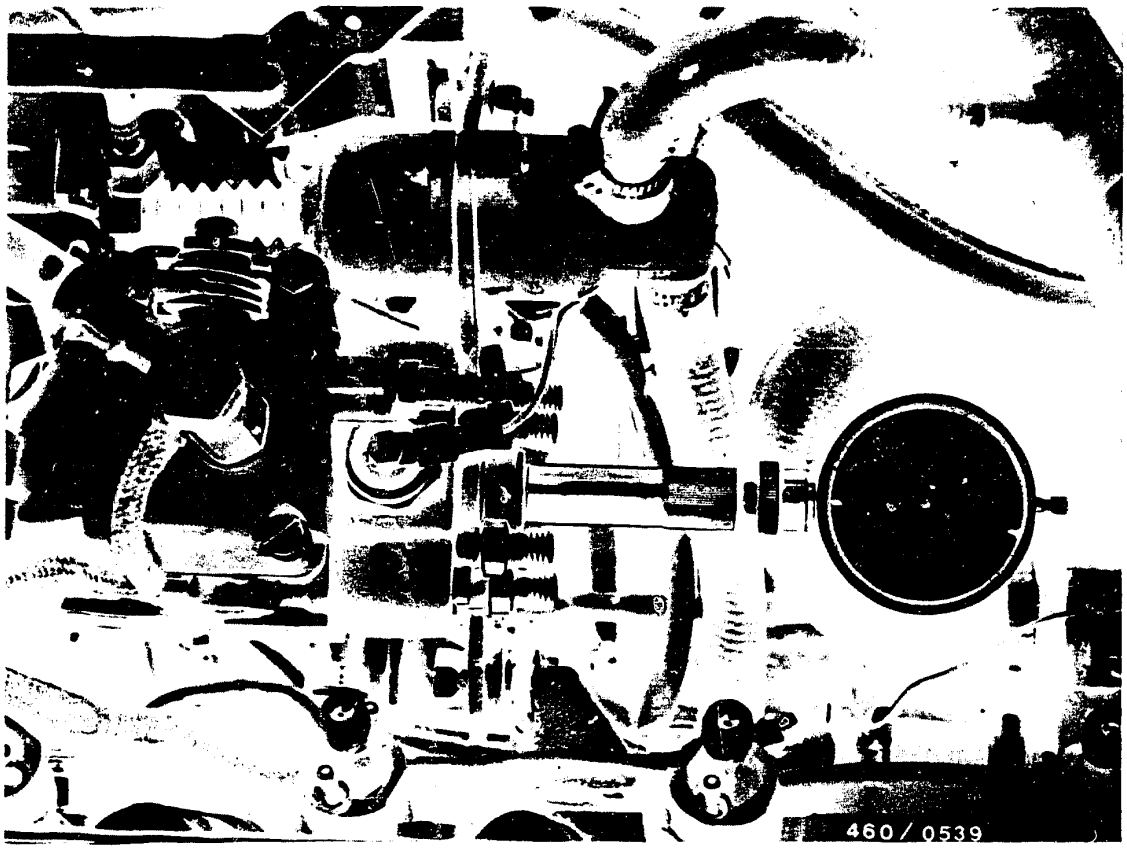
To do this, loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) in direction of hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft until control lever (3) is up against the stop bracket.
In this position the control device is off.

Caution!

Locating screw (4) must not be loosened since, otherwise, it will be necessary to reset the control device.



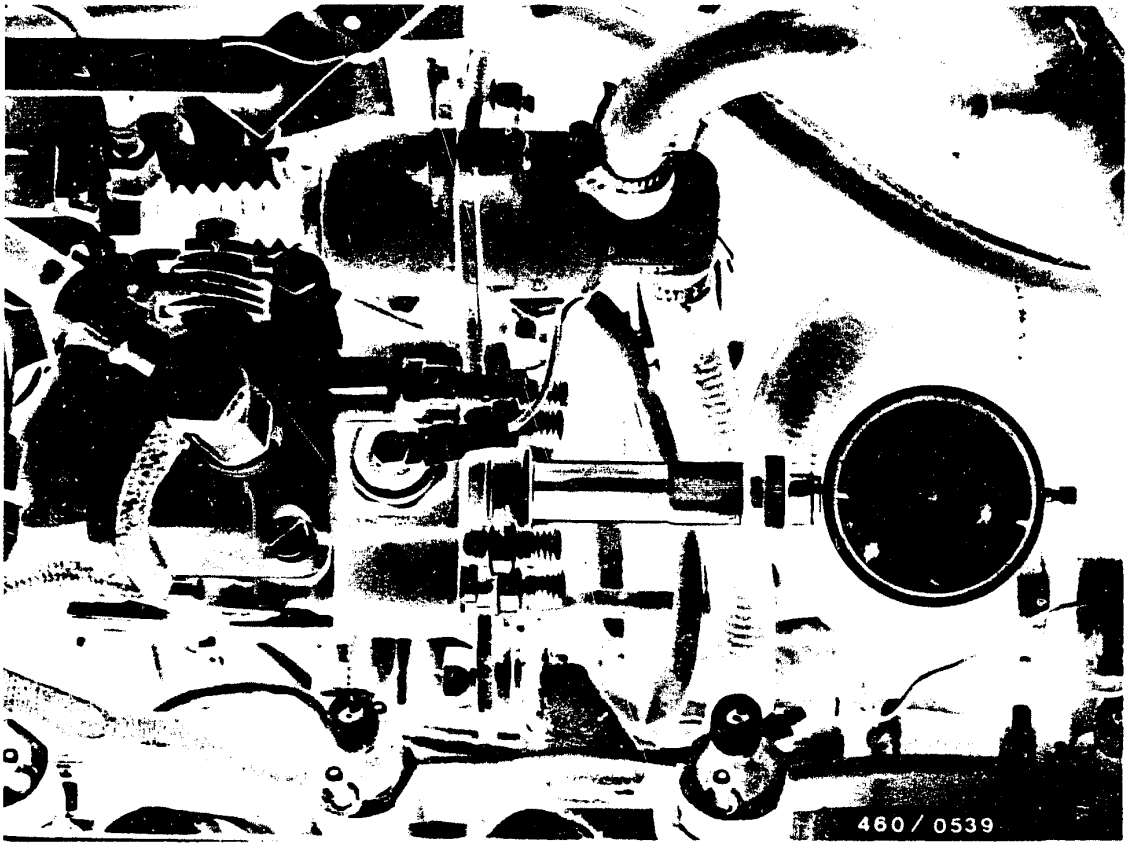
Screw bleeder screw out of central screw plug (triangular plug) of hydraulic head.

Mount measuring tool KDEP 1085 with dial indicator in the tapped hole.

Preload dial indicator by approx. 2.5 mm.

Slowly turn crankshaft against the engine direction of rotation until the pointer of the dial indicator no longer moves.

Preload dial indicator by approx. 1 mm and set to "0".



Turn crankshaft in engine direction of rotation until TDC mark on flywheel is in alignment with reference mark on clutch housing.

Check position of pump gear with setting mandrel KDEP 1122.

The dial indicator must indicate one of the following values as setting dimension:

Pump position 0.85 ± 0.02 mm after BDC (AUDI 100 5 D)
Pump position 0.93 ± 0.02 mm after BDC (AUDI 100 5 D Turbo)

If a correction is necessary, loosen injection-pump fastening screws and set the respective stroke by pivoting.

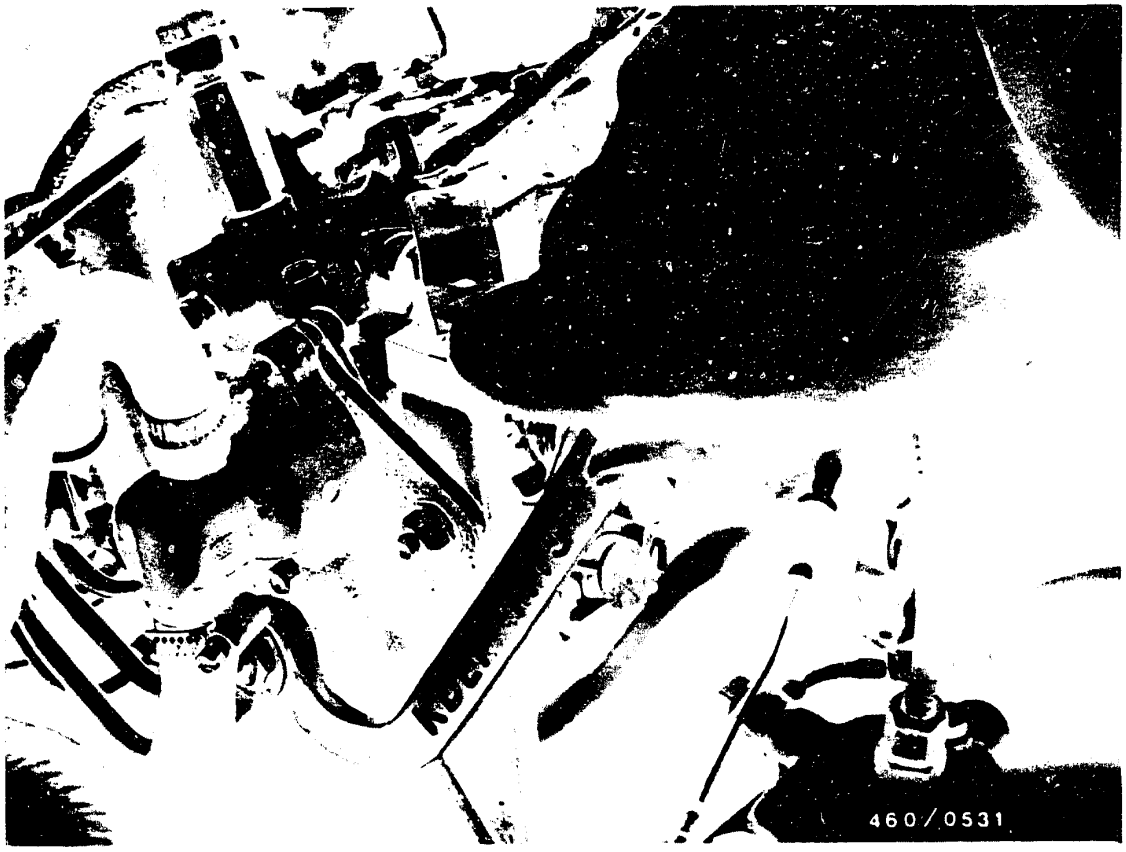
Setting values:

Pump position 0.85 ± 0.02 mm after BDC (AUDI 100 5 D)
Pump position 0.93 ± 0.02 mm after BDC (AUDI 100 5 D Turbo)

Tighten fastening screws to 25 Nm. Turn crankshaft over twice and check setting.

Remove measuring tool KDEP 1085 with dial indicator.

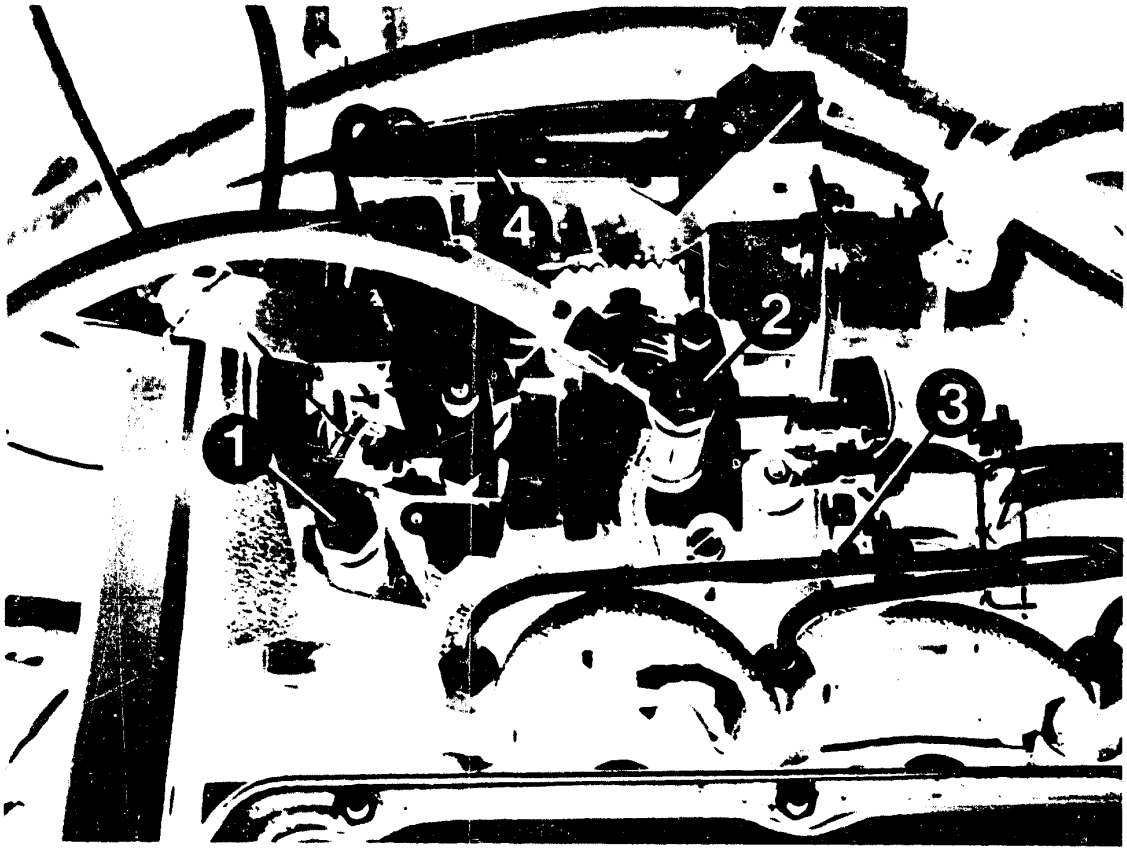
Mount bleeder screw with new seal ring.



Tighten fuel-injection lines using open box wrench KDEP 1115.

Caution!

When tightening, prevent the delivery-valve holders from turning by holding with a wrench.



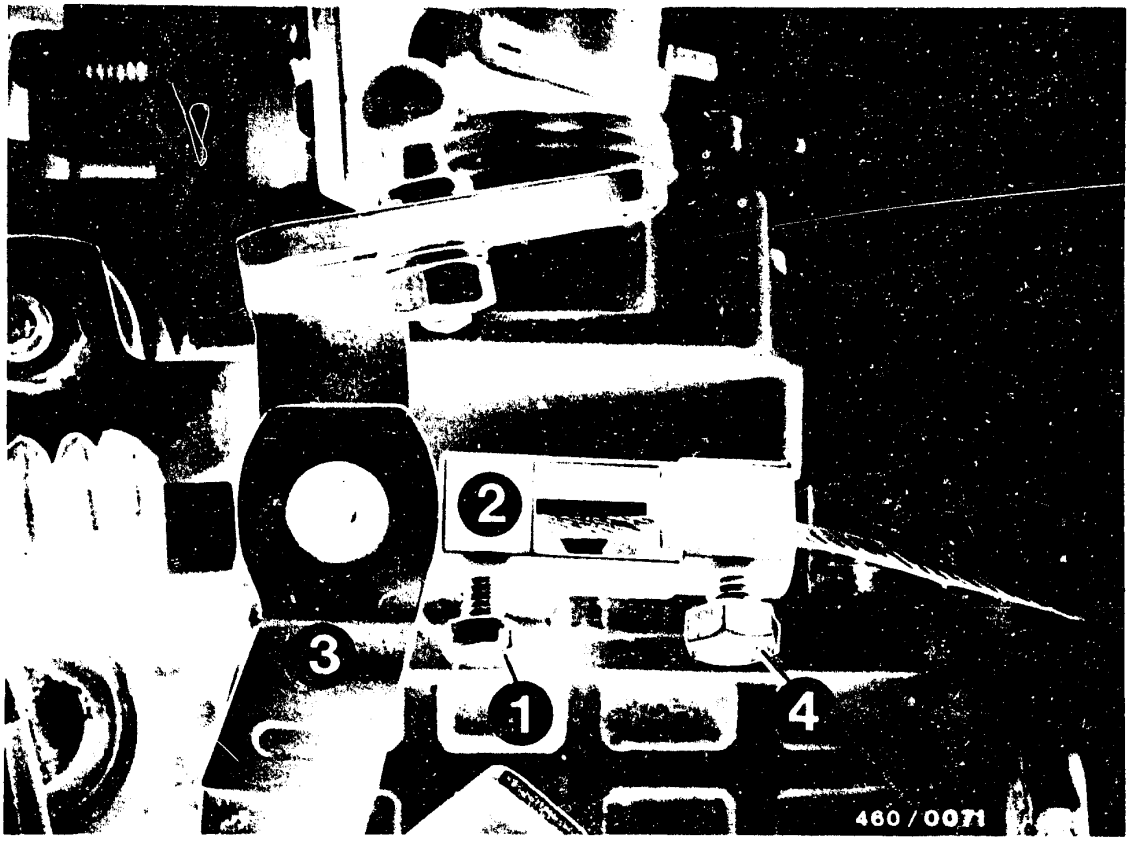
Mount fuel inlet line (1) and return line (2) on injection pump.

Connect cable for electric shutoff device (3).

Mount connecting part for control lever (4).

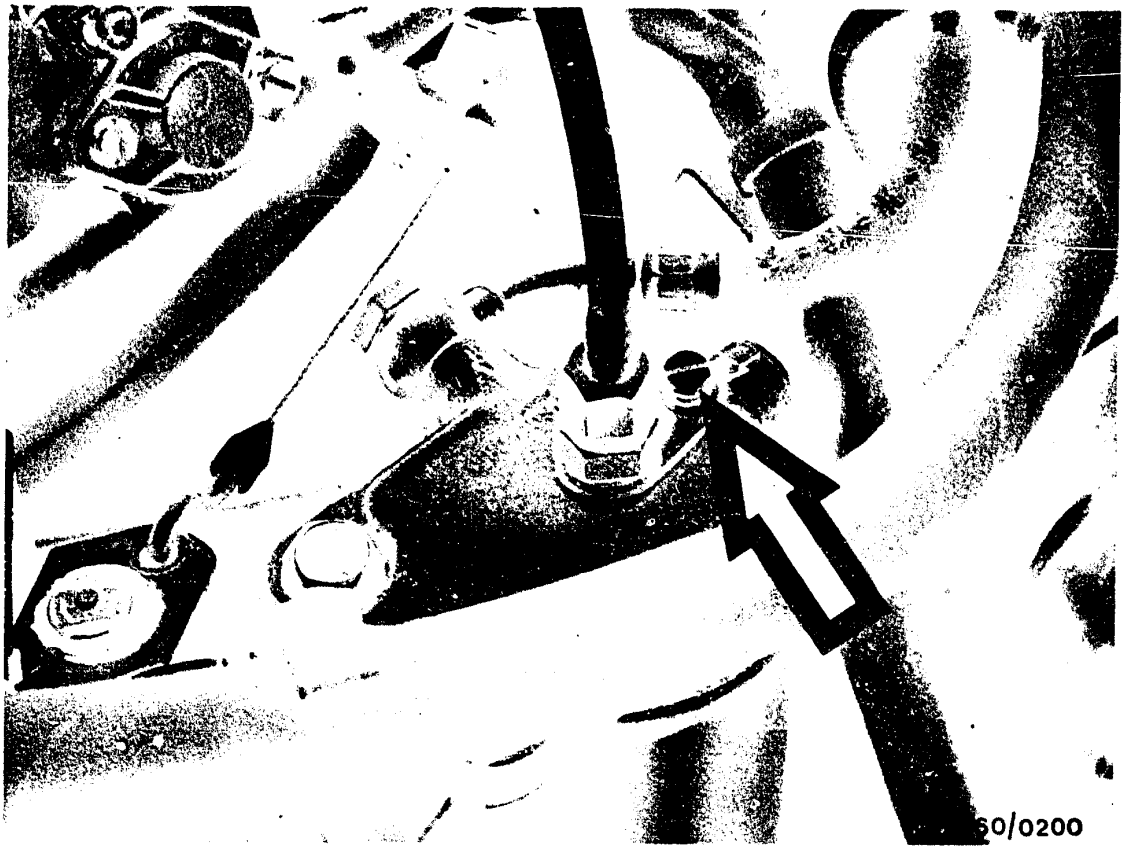
Note:

The inlet-union screws for fuel inlet and return lines must not be mixed up.
The inlet-union screw of the return line is provided with restriction bores and the head of the screw is marked with the word "Cut".
Connect the negative battery terminal.



Pull control lever (3) with intermediate piece (2) toward hydraulic head.
Turn intermediate piece (2) through 90° and push again toward drive shaft.
Intermediate piece is in the starting position.
Tighten clamping screw (1).

Mount pan on underside of engine.



Bleed the fuel system.

Fill the fuel filter and injection pump with diesel fuel.

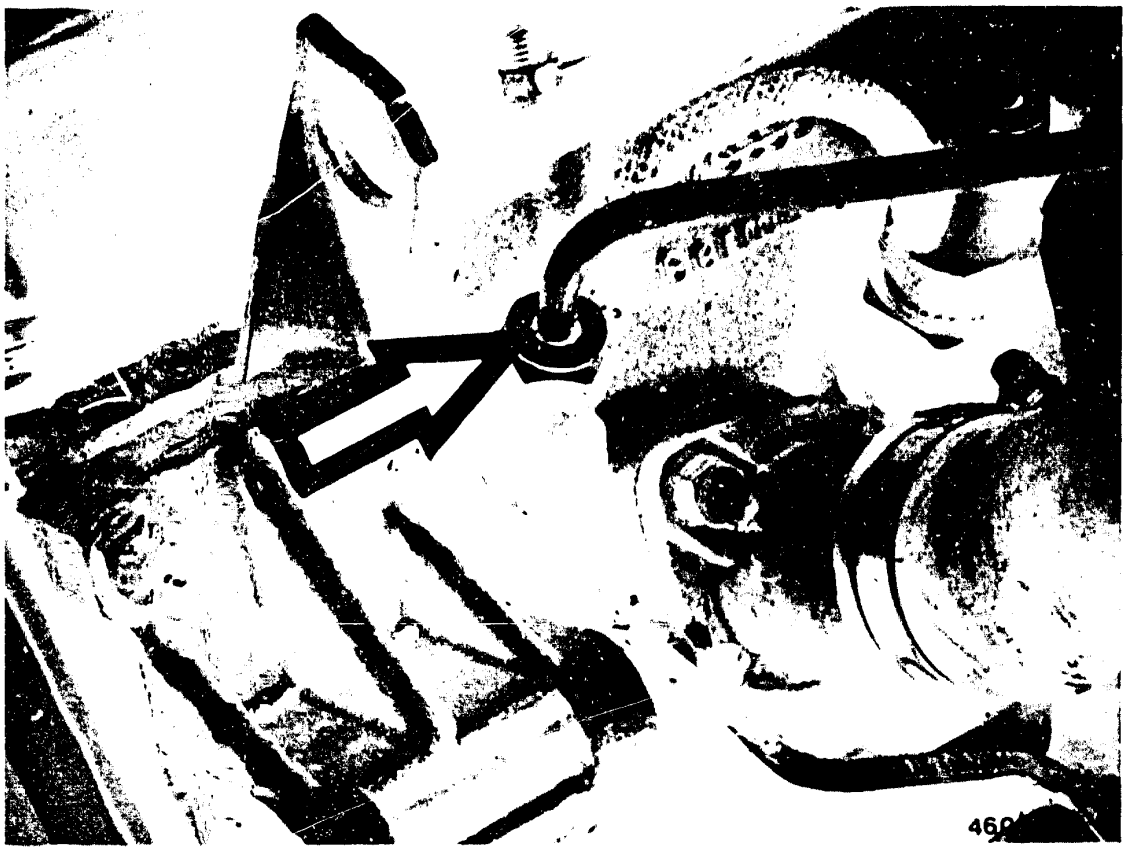
Tighten hose connections on filter cover.

If fitted, close bleeder screw on fuel filter (arrow).

Loosen bleeder screw on injection pump and screw out by a few turns (arrow).

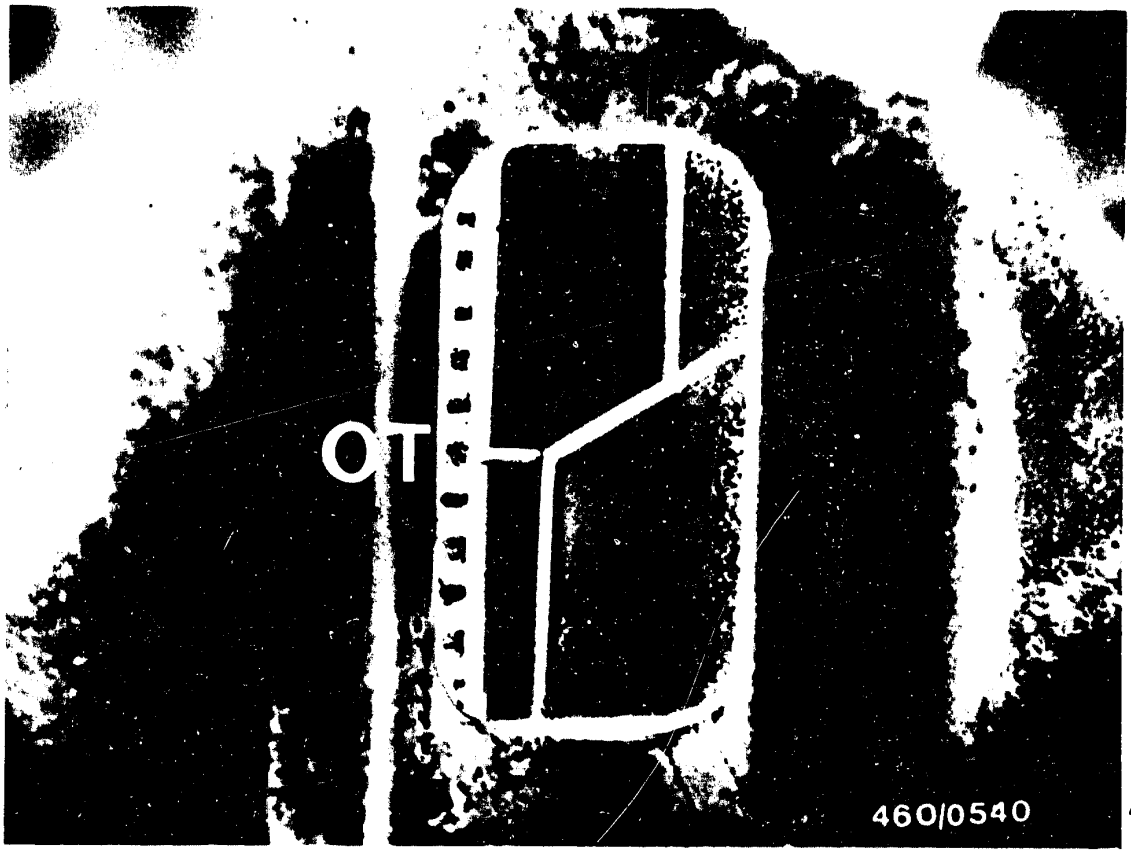
Loosen union nuts of fuel-injection tubing on nozzle holders.

Operate starting motor without preheating. When the fuel escaping from the injection pump bleed hole is free of bubbles, retighten the bleeder screw again.



Continue to operate starting motor until fuel escapes from the union nuts of the nozzle holders (arrow).

Tighten union nuts and operate starting motor until engine starts.



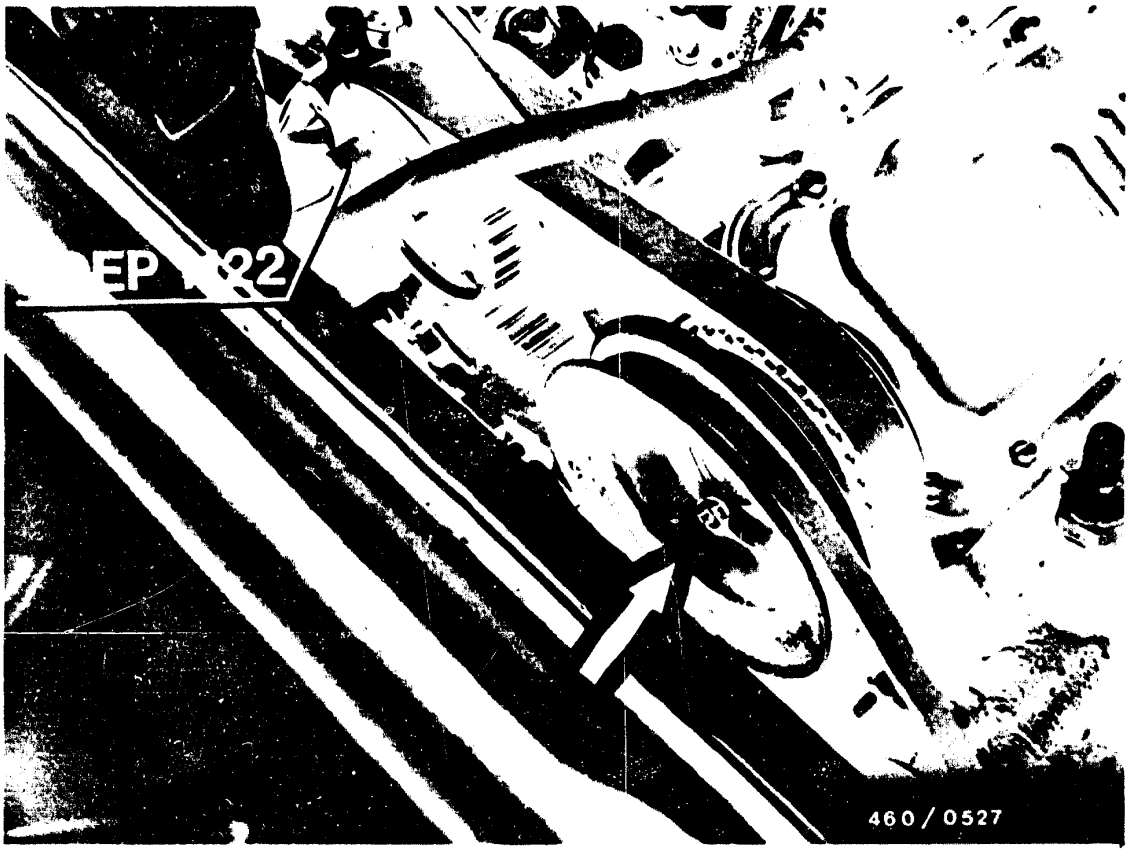
26. Test and adjust engine timing

26.1 Test engine timing

Remove cylinder-head cover and protective cover of toothed belt for injection pump.

Turn the crankshaft to TDC on cylinder 1.

The mark on the flywheel and the reference mark on the clutch housing must be in alignment.



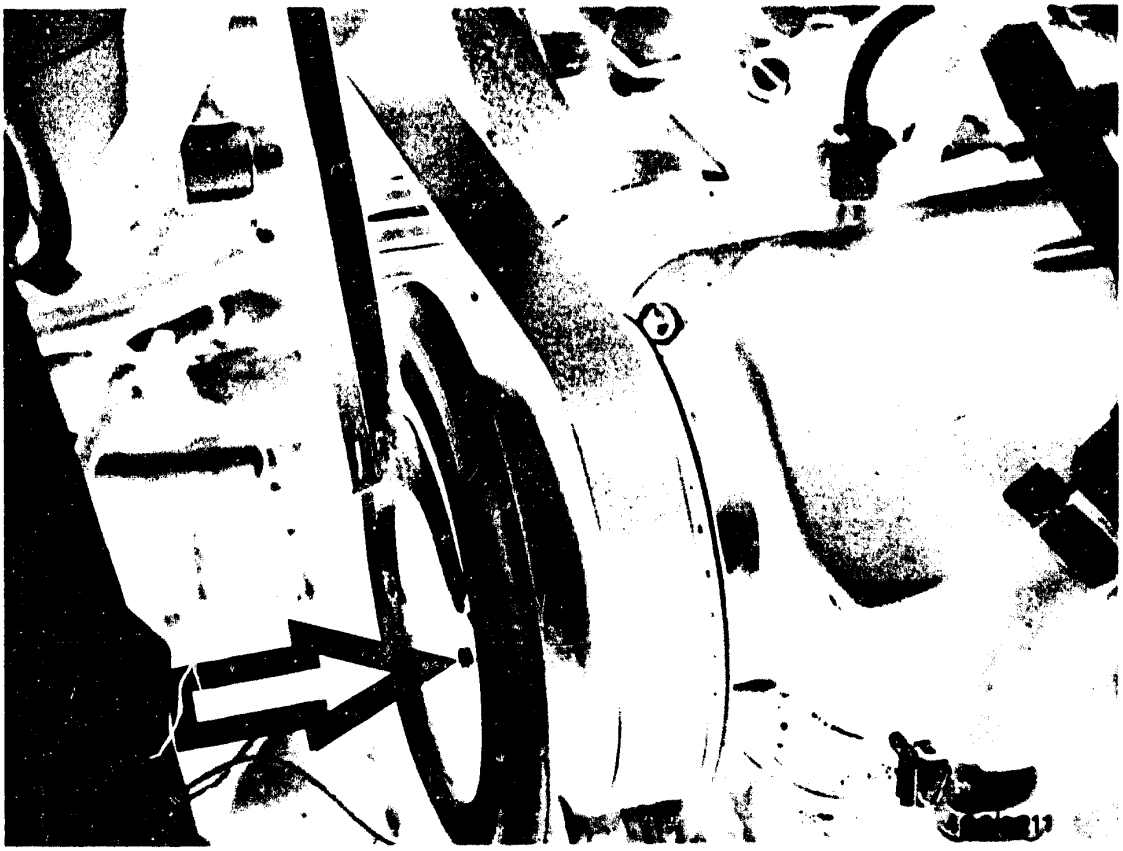
Lock injection-pump gear using setting mandrel KDEP 1122.

Note:

Only for AUDI 100 5 D (up to 8.82):

Remove hexagon nuts of pulley (arrow) with spring lock washers.

Remove front half of pulley and V-belt.

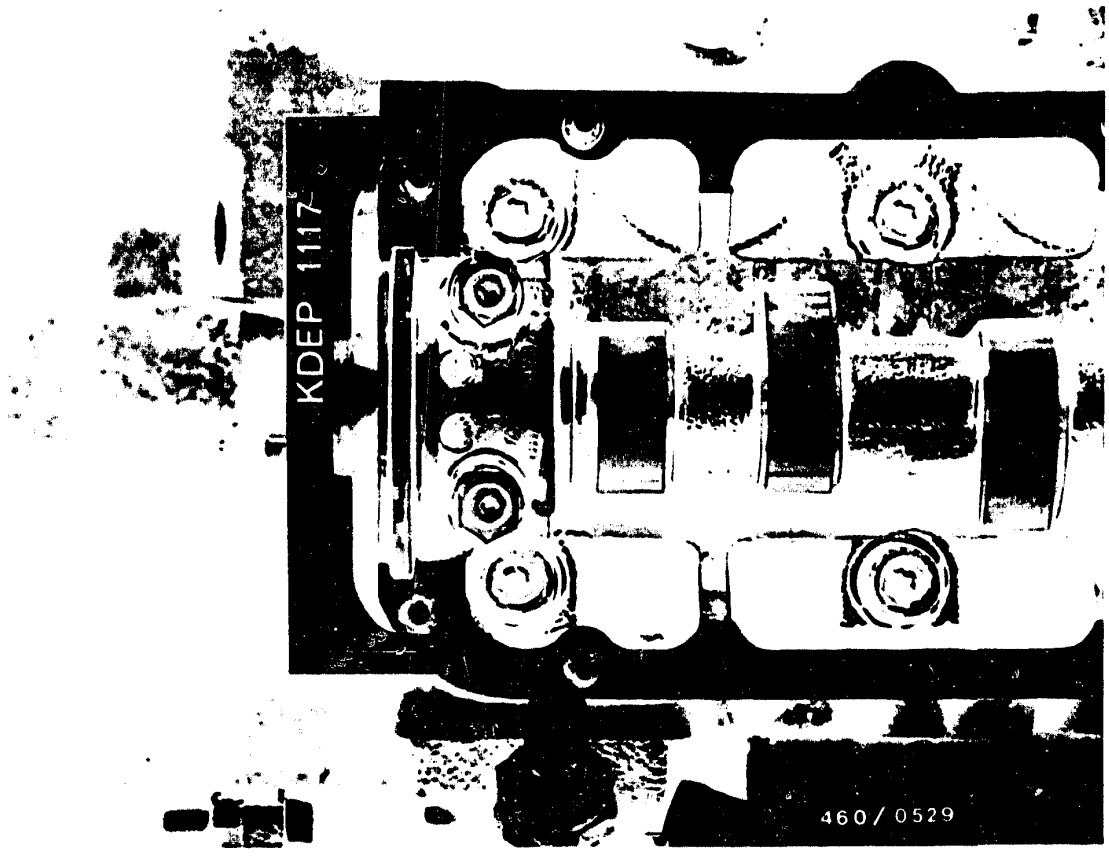


Lock engine camshaft gear with holder KDEP 1116.

Loosen fastening screw (arrow) and unscrew.

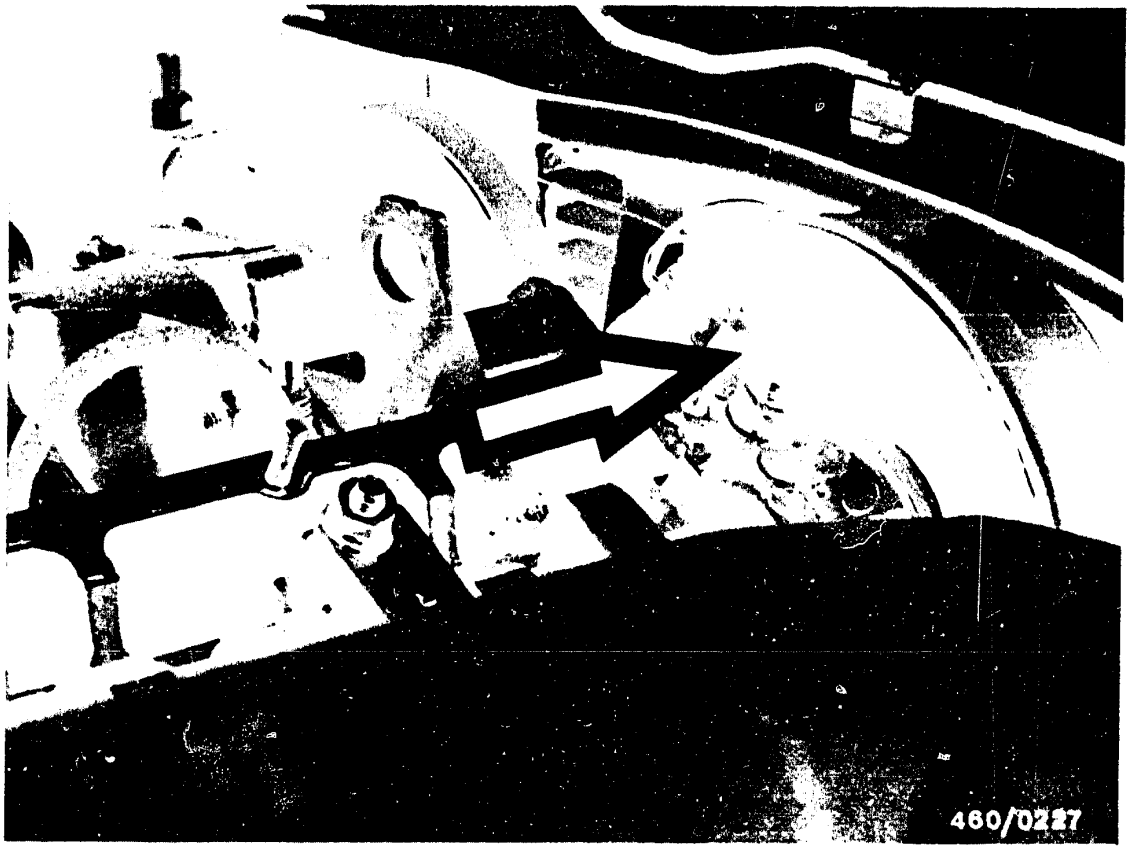
Remove camshaft gear with toothed belt and pulley half from camshaft.

Check TDC position at flywheel.



Insert setting rule KDEP 1117 into recess of camshaft.

If setting rule cannot be introduced, the engine timing must be corrected.



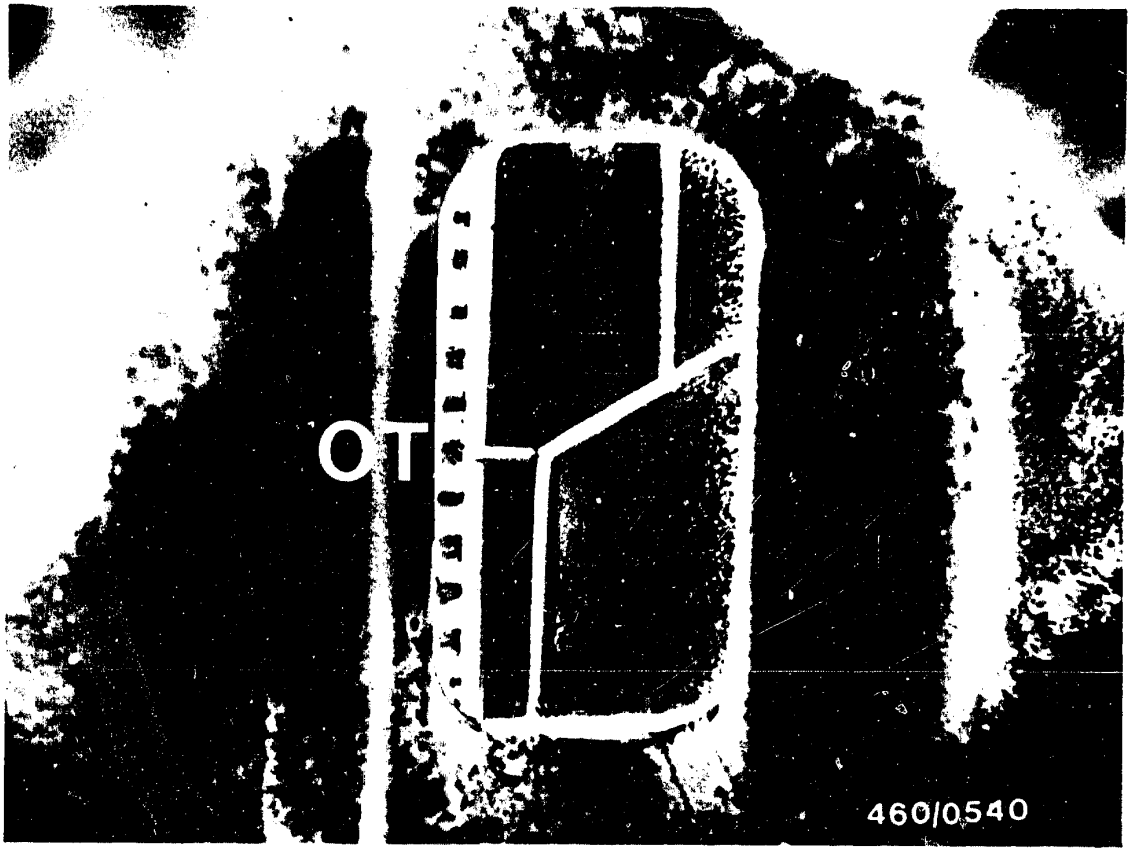
26.2 Adjust engine timing

Turn crankshaft so that setting rule can be introduced.

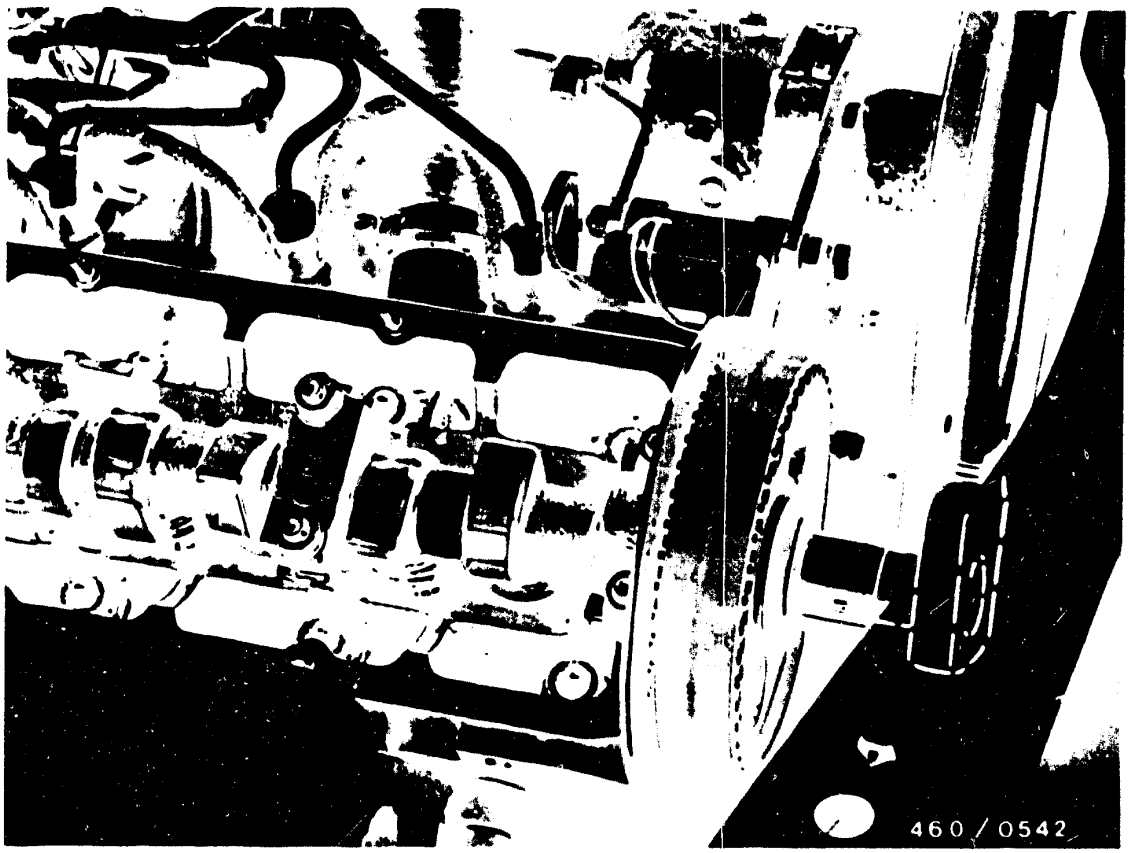
Remove toothed-belt protective cover for camshaft drive.

Loosen fastening screw of camshaft drive gear by one turn.

Loosen camshaft drive gear from camshaft by tapping with a hammer.
To do this, guide mandrel through the opening in the cover plate (arrow).



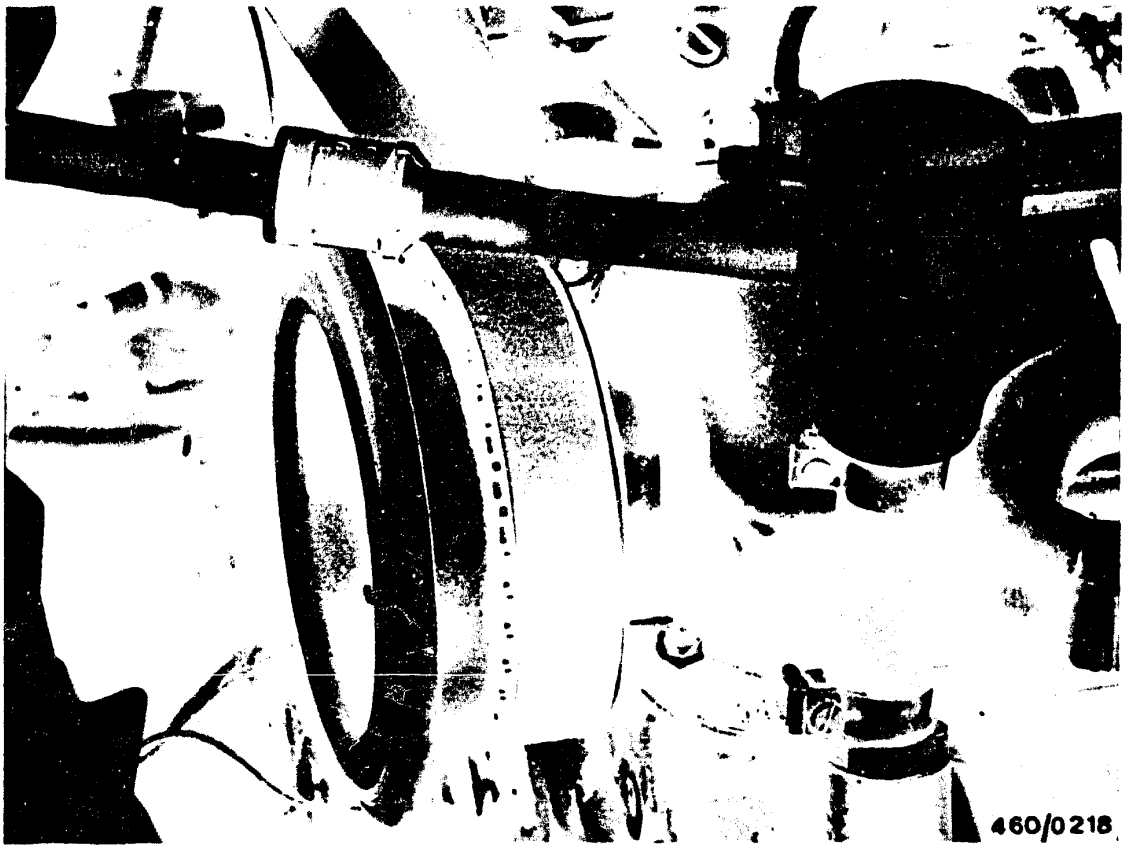
Turn crankshaft until TDC marks on flywheel and clutch housing are in alignment.



In this position, tighten camshaft drive gear to 45 Nm.

Remove setting rule KDEP 1117.

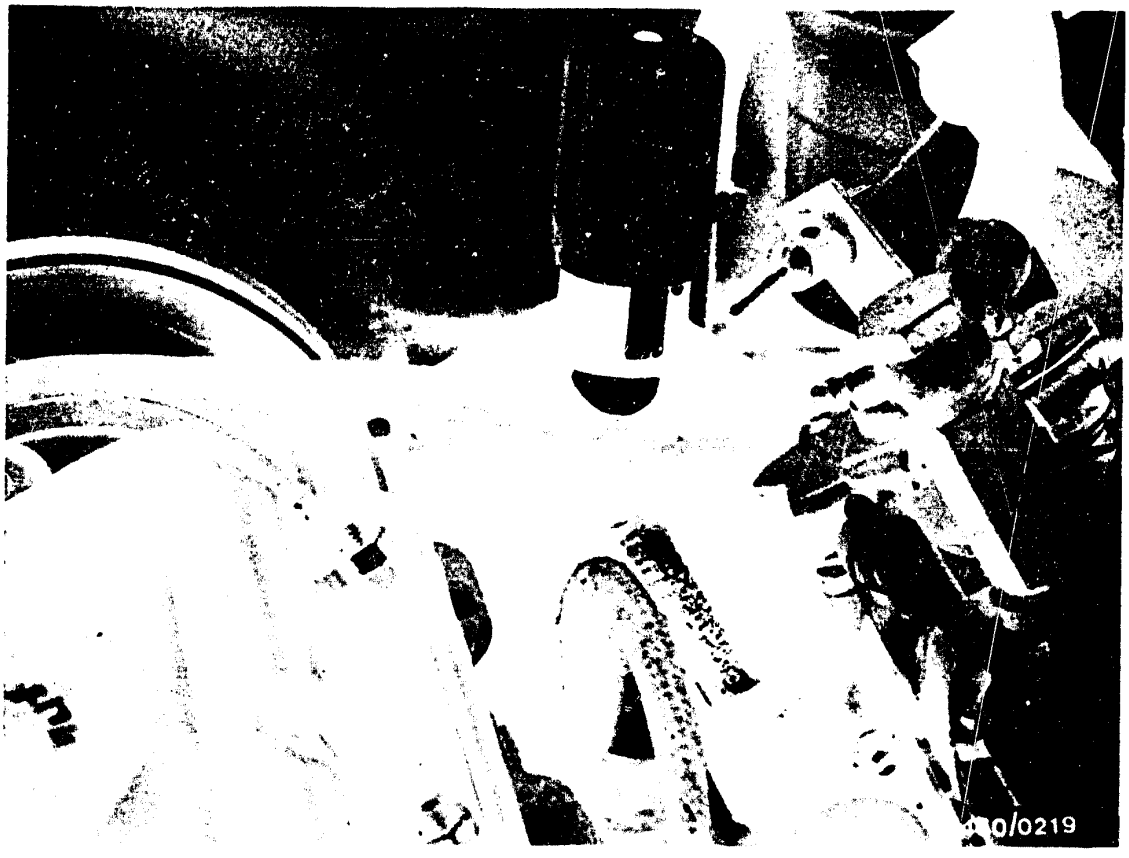
Mount toothed-belt guard and cylinder head cover.



Mount toothed belt for injection pump with camshaft gear.

Tighten fastening screw by hand so that camshaft gear can still be moved.

Remove setting mandrel KDEP 1122.

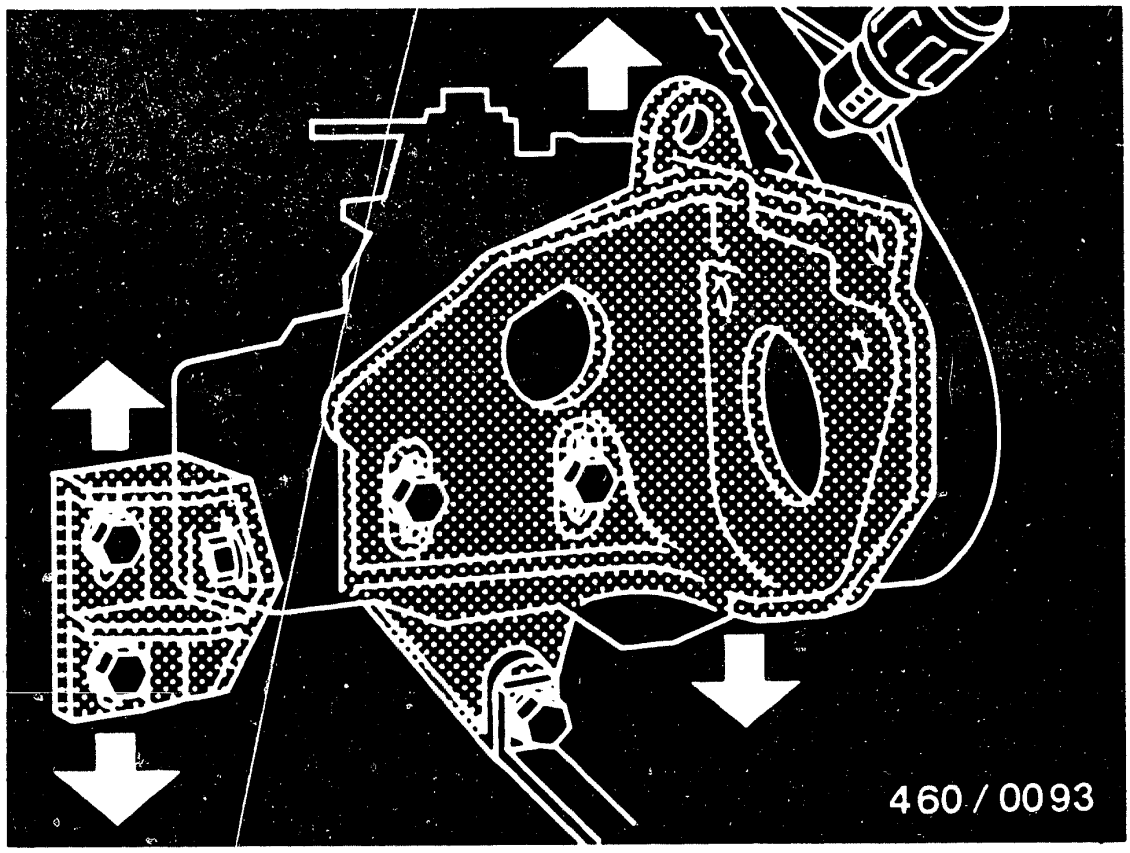


Test tension of toothed belt using belt tension tester KDEP 1121.

Turn vernier sleeve until bottom edge of sleeve aligns with the line mark on the measuring lug.

Make reading:

Set value: Scale value 12...13



If the measured dimension differs from the set value, loosen fastening screws of pump bracket and of holding bracket on hydraulic head.

Move injection pump with bracket up or down as required (arrows).

Tighten fastening screws of pump bracket and of holding bracket to 65 Nm.

Turn engine crankshaft over twice and check tension of toothed belt again.

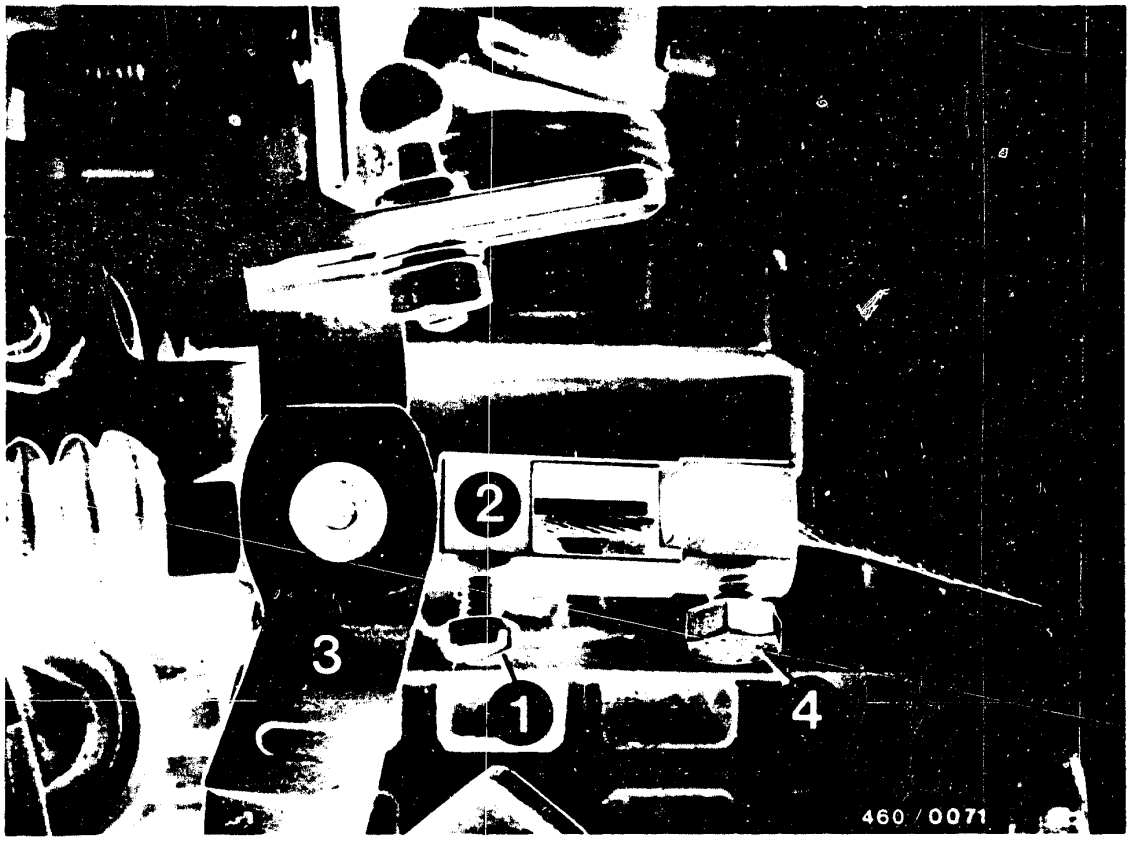
Check TDC position of crankshaft.

Lock injection-pump gear with setting mandrel KDEP 1122.

Hold camshaft gear with holder KDEP 1116 and tighten fastening screw to 100 Nm.

Mount front pulley half with V-belt and tighten hexagon nuts (only on AUDI 100 5 D up to 8.82).

Remove setting mandrel KDEP 1122.



When testing and setting the start of delivery, the temperature-controlled cold-start accelerator must be in the zero position.

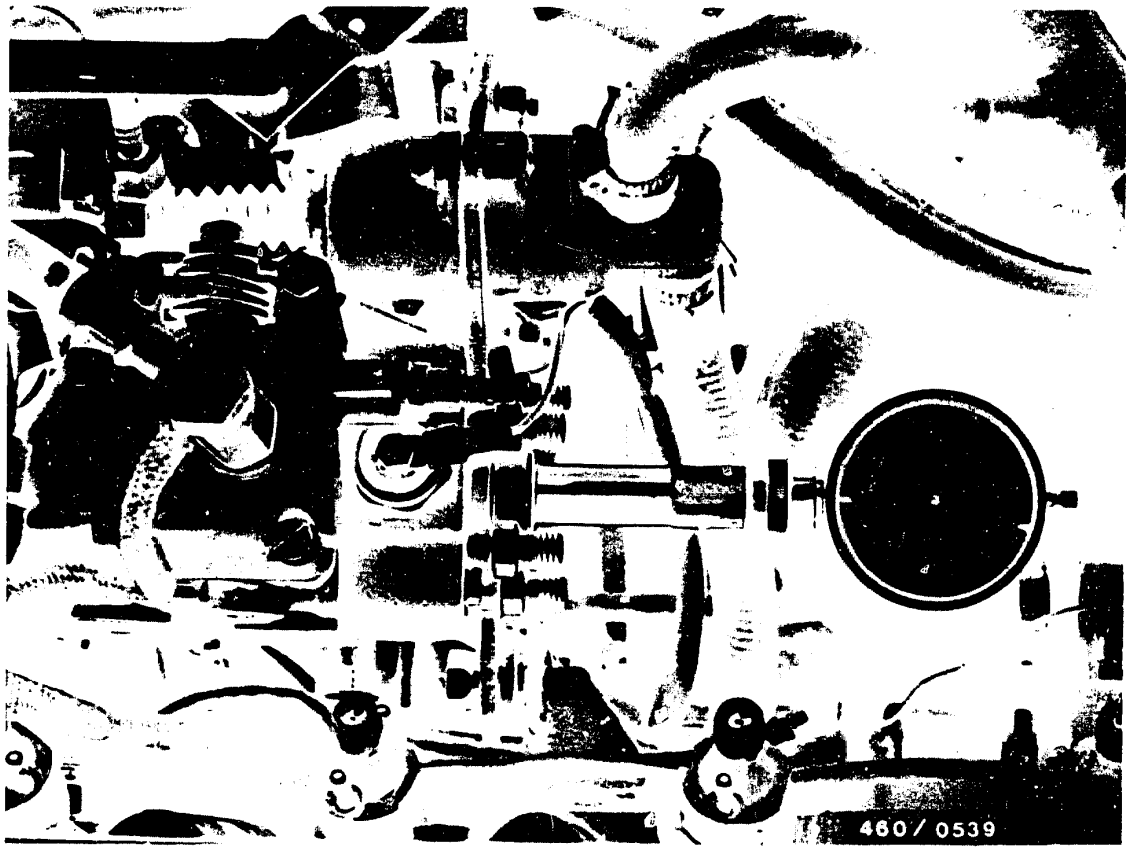
To do this, loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) in direction of hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft until control lever (3) is up against the stop bracket.
In this position the control device is off.

Caution!

Locating screw (4) must not be loosened since, otherwise, it will be necessary to reset the control device.



Remove injection lines from injection pump and nozzle holders.

Caution!

Prevent the delivery-valve holders from coming loose by holding with a wrench.

Screw bleeder screw out of central screw plug (triangular plug) of hydraulic head.

Mount measuring tool KDEP 1085 with dial indicator in the tapped hole.

Preload dial indicator by approx. 2.5 mm.

Slowly turn crankshaft against the engine direction of rotation until the pointer of the dial indicator no longer moves.

Preload dial indicator by approx. 1 mm and set to "0".

Turn crankshaft in engine direction of rotation until TDC mark on flywheel is in alignment with reference mark on clutch housing.

Check position of pump gear with setting mandrel KDEP 1122.

The dial indicator must indicate one of the following values as checking dimension.

Pump position 0.80...0.90 mm after BDC (AUDI 100 5 D)

Pump position 0.88...0.98 mm after BDC (AUDI 100 5 D Turbo)

If a correction is necessary, loosen injection-pump fastening screws and set the respective stroke by pivoting.

Setting values:

Pump position 0.85 ± 0.02 mm after BDC (AUDI 100 5 D)

Pump position 0.93 ± 0.02 mm after BDC (AUDI 100 5 D Turbo)

Tighten fastening screws to 25 Nm. Turn crankshaft over twice and check setting.

Mount toothed-belt cover.

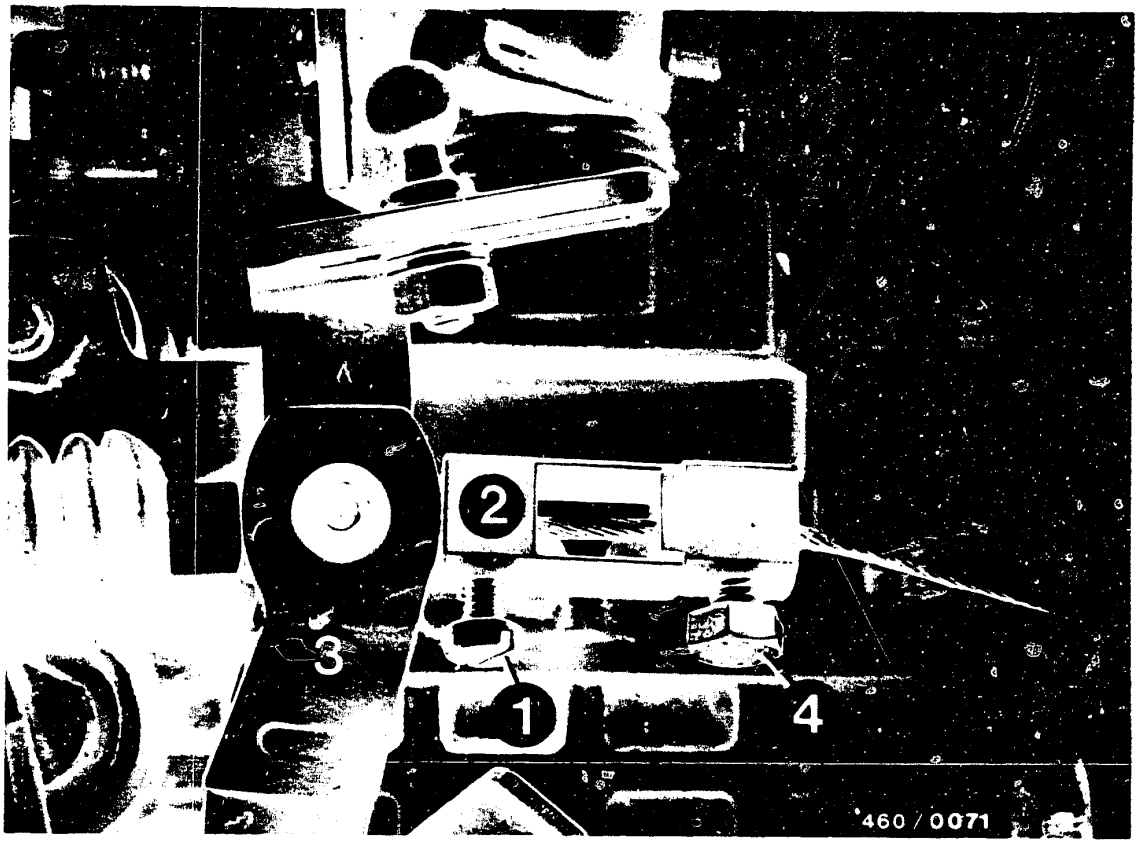
Remove measuring tool KDEP 1085 with dial indicator.

Mount bleeder screw with new seal ring.

Secure injection lines on injection pump and nozzle holders.

Caution!

When tightening, prevent the delivery-valve holders from turning by holding with a wrench.

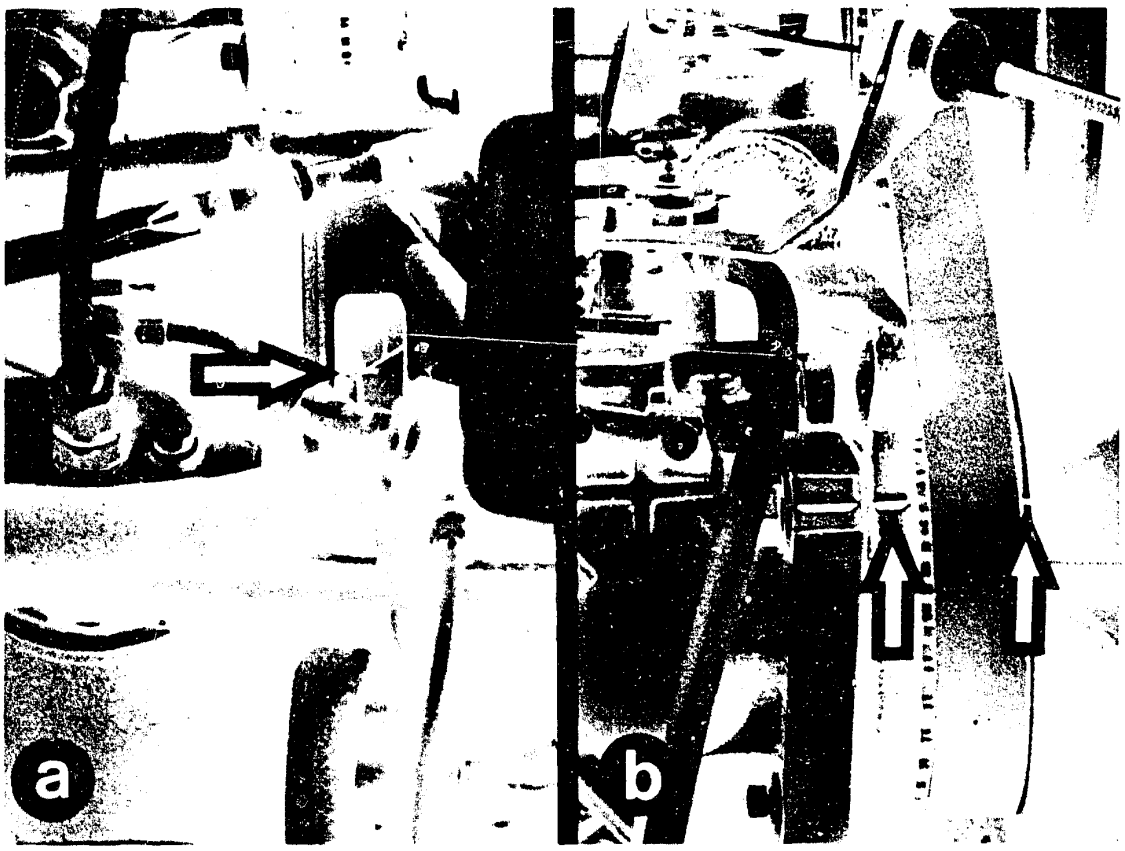


Pull control lever (3) with intermediate piece (2) in direction of hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

Intermediate piece is in starting position (picture).

Tighten clamping screw (1).

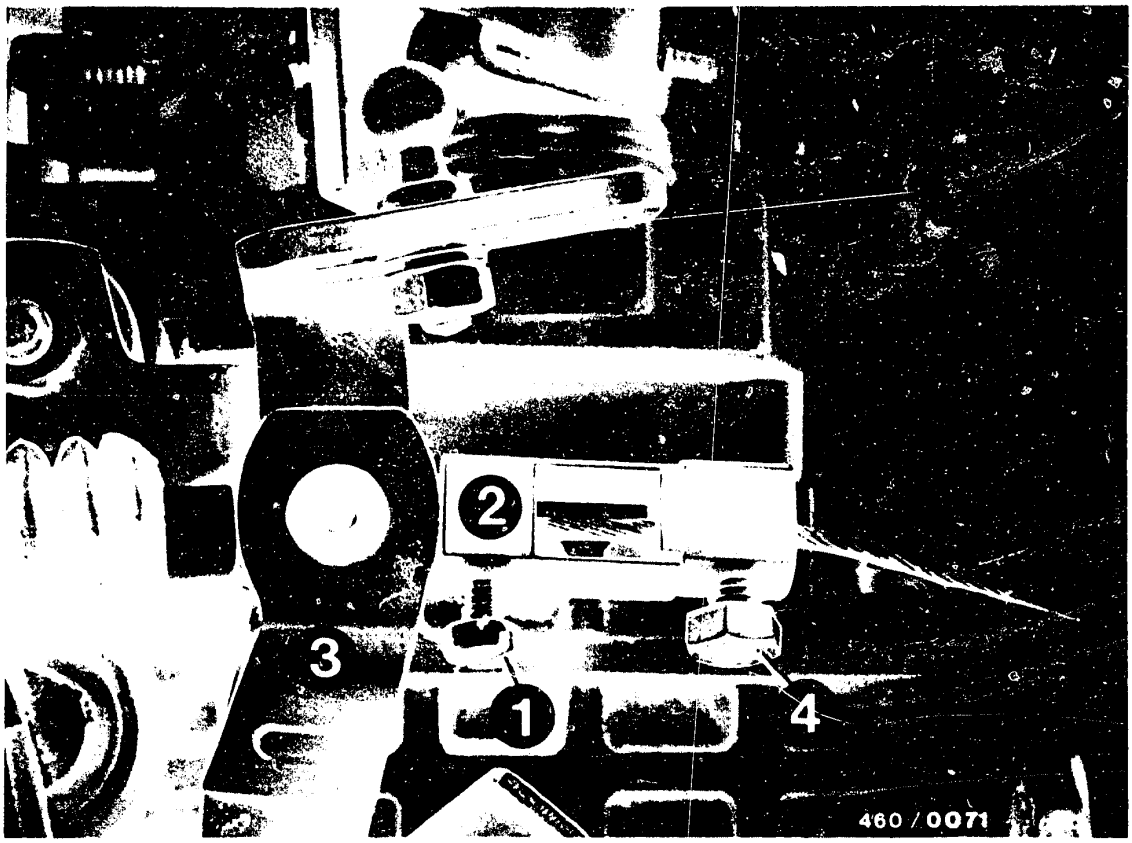


27. Injection timing

Remove toothed-belt cover.

Turn crankshaft until mark on flywheel aligns with reference mark on clutch housing (picture a).

In this position, notch marks on injection-pump gear and pump bracket must be in alignment (picture b).



When testing and setting the start of delivery, the temperature-controlled cold-start accelerator must be in the zero position.

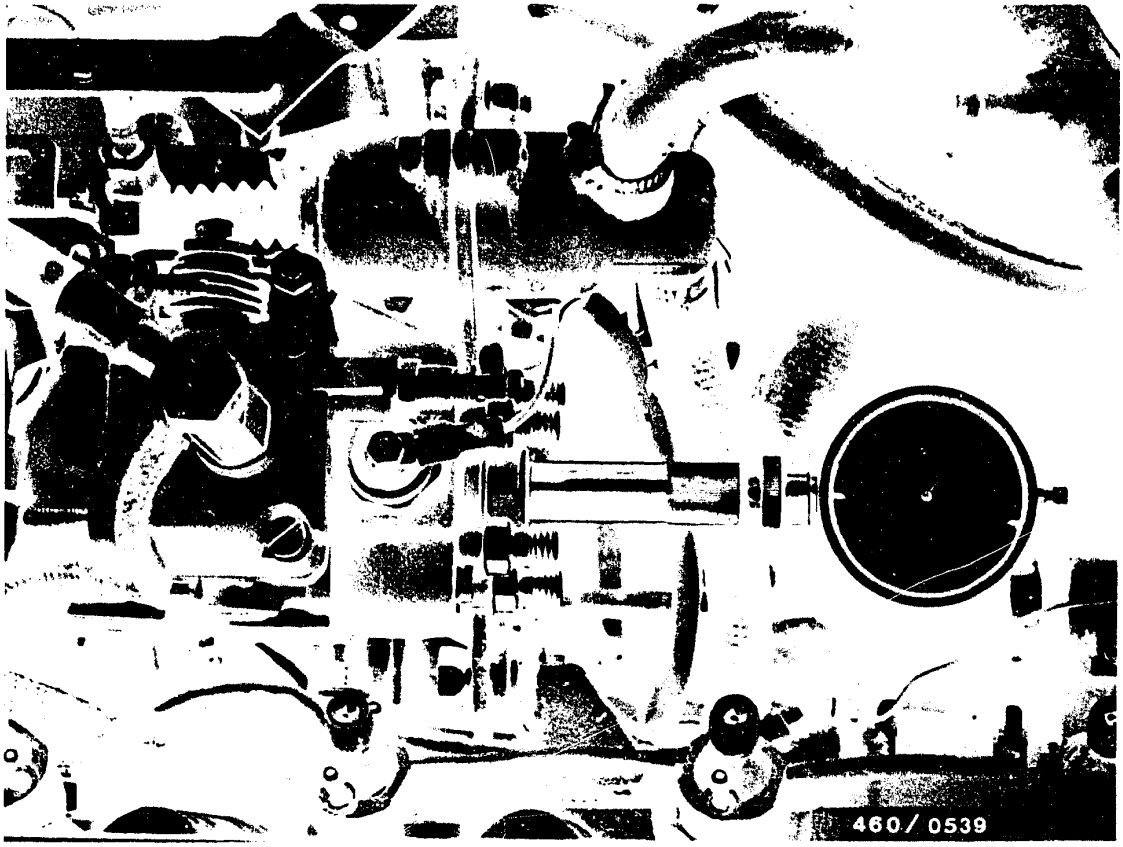
To do this, loosen clamping screw (1) on injection pump.

Pull intermediate piece (2) with control lever (3) in direction of hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft until control lever (3) is up against the stop bracket.
In this position the control device is off.

Caution!

Locating screw (4) must not be loosened since, otherwise, it will be necessary to reset the control device.



Remove injection lines from injection pump and nozzle holders.

Caution!

Prevent the delivery-valve holders from coming loose by holding with a wrench.

Screw bleeder screw out of central screw plug (triangular plug) of hydraulic head.

Mount measuring tool KDEP 1085 with dial indicator in the tapped hole.

Preload dial indicator by approx. 2.5 mm.

Slowly turn crankshaft against the engine direction of rotation until the pointer of the dial indicator no longer moves.

Preload dial indicator by approx. 1 mm and set to "0".

Turn crankshaft in engine direction of rotation until TDC mark on flywheel is in alignment with reference mark on clutch housing.

Check position of pump gear with setting mandrel KDEP 1122.

The dial indicator must indicate one of the following values as checking dimension.

Pump position 0.80...0.90 mm after BDC (AUDI 100 5 D)

Pump position 0.88...0.98 mm after BDC (AUDI 100 5 D Turbo)

If a correction is necessary, loosen injection-pump fastening screws and set the respective stroke by pivoting.

Setting values:

Pump position 0.85 ± 0.02 mm after BDC (AUDI 100 5 D)

Pump position 0.93 ± 0.02 mm after BDC (AUDI 100 5 D Turbo)

Tighten fastening screws to 25 Nm. Turn crankshaft over twice and check setting.

Mount. toothed-belt cover.

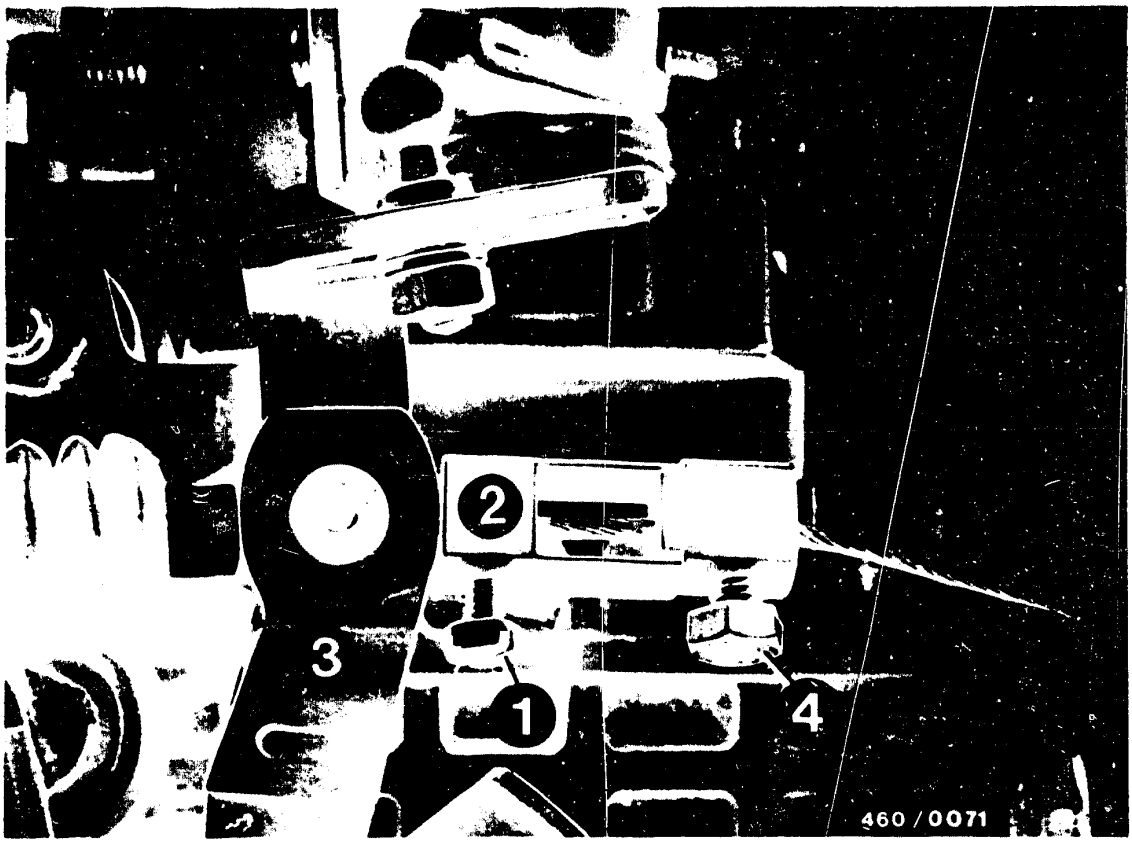
Remove measuring tool KDEP 1085 with dial indicator.

Mount bleeder screw with new seal ring.

Secure injection lines on injection pump and nozzle holders.

Caution!

When tightening, prevent the delivery-valve holders from turning by holding with a wrench.

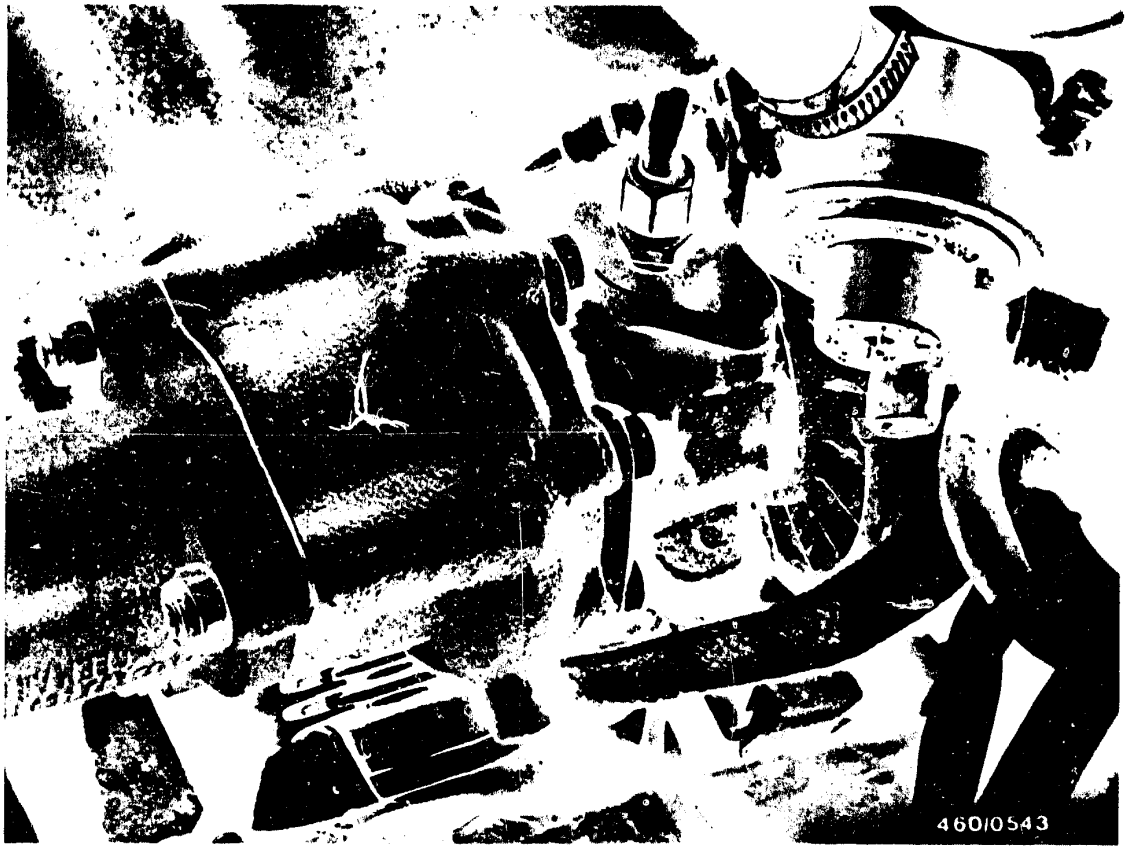


Pull control lever (3) with intermediate piece (2) toward hydraulic head.

Turn intermediate piece (2) through 90° and push again toward drive shaft.

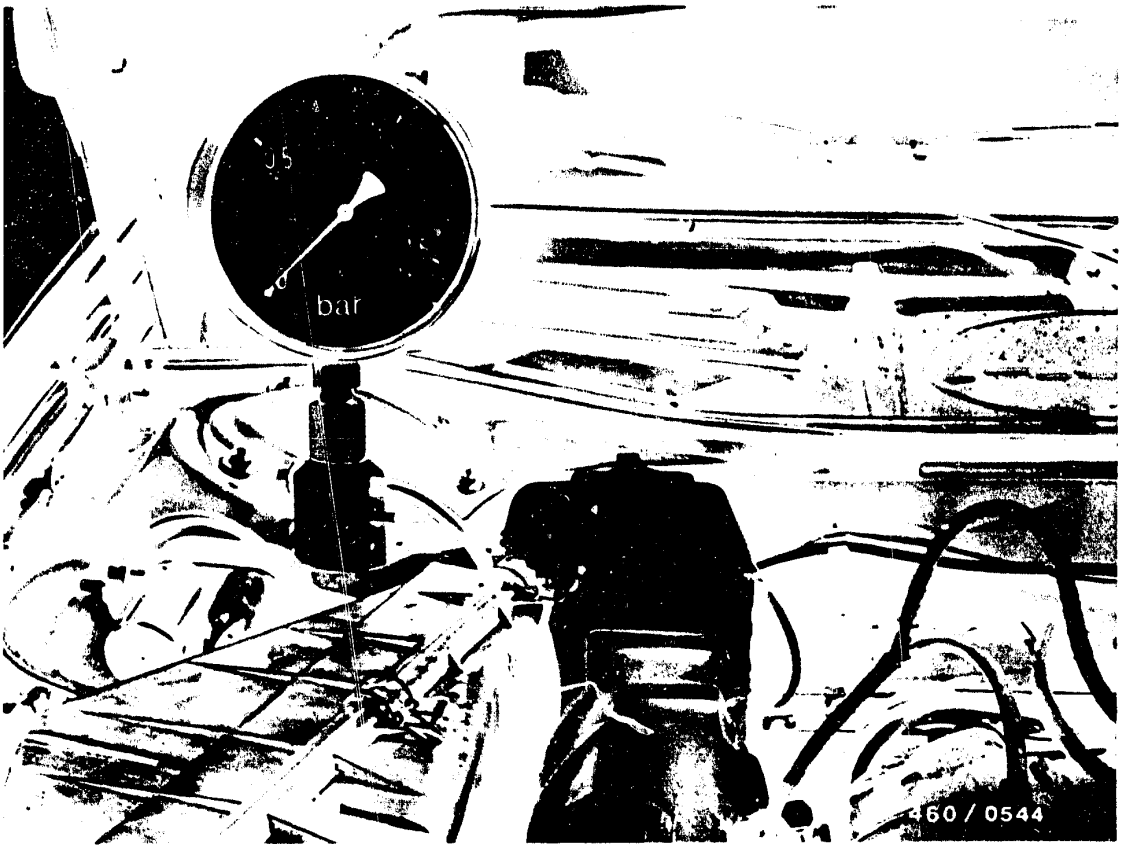
Intermediate piece is in the starting position.

Tighten clamping screw (1).

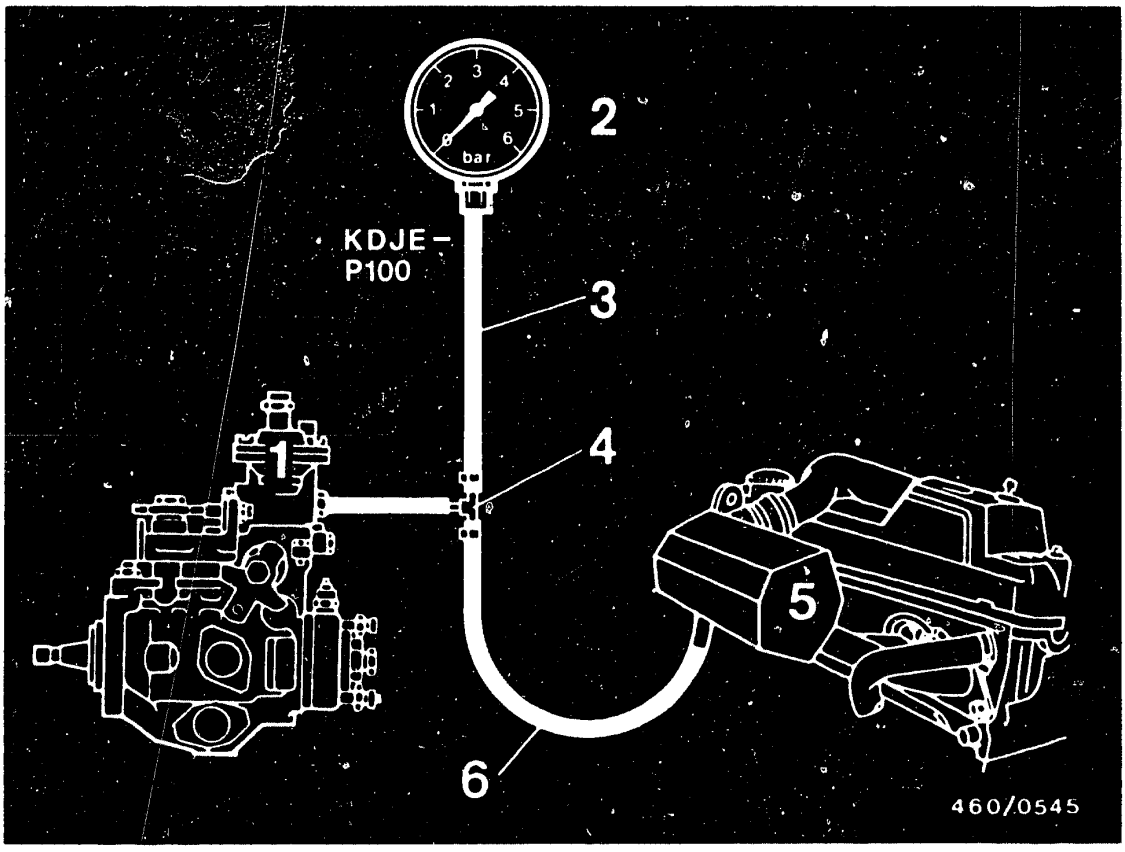


28. Test charge-air pressure

When working on the turbocharger, it should be noted that even the smallest particles of dirt can lead to the destruction of the turbocharger.
Therefore, never operate the engine without air filter.



To test the charge-air pressure, it is possible to use the pressure tester KDJE-P 100 or a pressure gauge 0 ... 16 bar (e. g. Wika No. 4184).



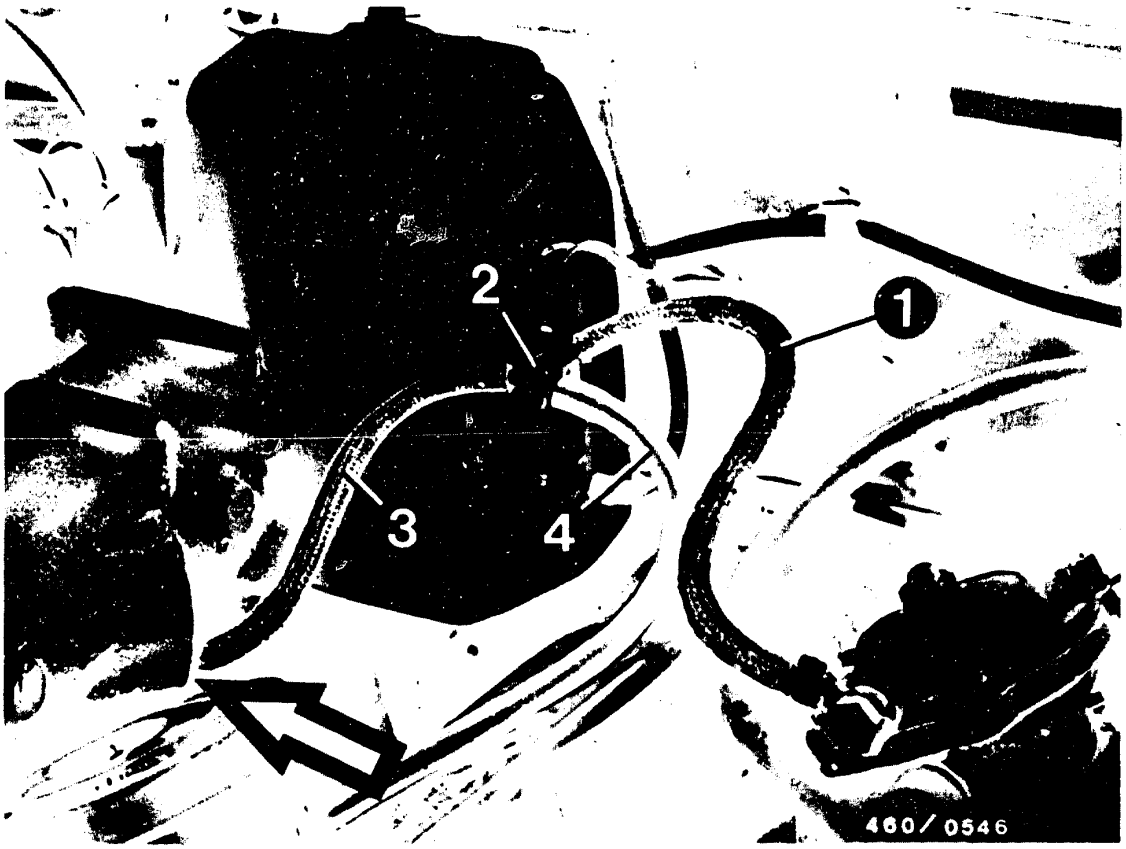
28.1 Mounting the pressure tester KDJE-P 100

Remove connecting hose between charge-air tube (5) and the manifold-pressure compensator of the injection pump (1) at the charge-air tube.

Fit T-piece (4).

Make connection to charge-air tube using commercially available hose (6).

Connect connecting hose (3) of pressure tester (2) to T-piece.



28:1.1 Mounting the pressure gauge for measuring the charge-air pressure

Remove connecting hose (1) between charge-air tube and manifold-pressure compensator of injection pump at charge-air tube (arrow).

Fit Y-piece (2).

Make connection to charge-air tube using commercially available hose (3).

Fit connecting hose from pressure gauge onto Y-piece (4).

28.2 Measuring the charge-air pressure

The charge-air pressure is measured at full load while driving or on the chassis dynamometer.

Test duration per measurement max. 10 s

- On the chassis dynamometer:

  In 3rd gear or in drive mode 2 at 4000 min^{-1}

- While driving:

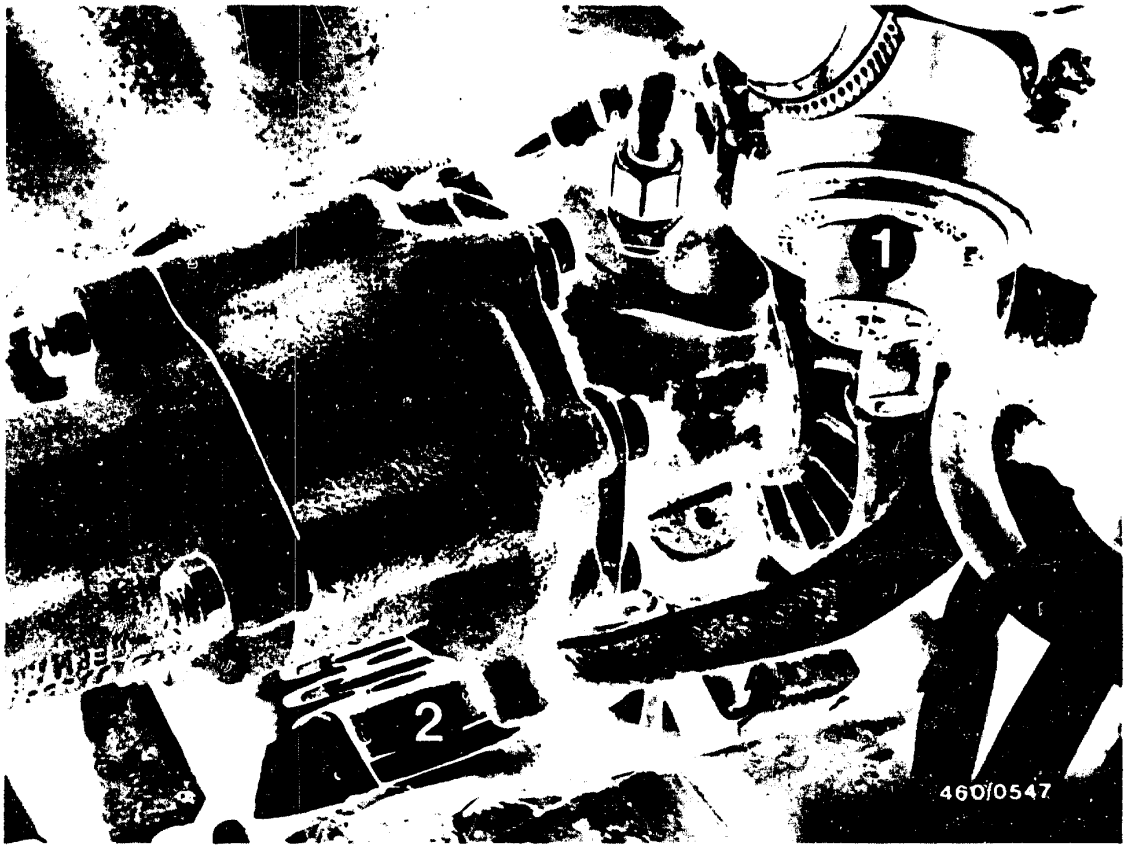
  In 2nd gear or in drive mode 1 by simultaneously braking the vehicle to approx. 60 km/h.

Read off charge-air pressure on pressure gauge.

Set value: 0.64 ... 0.72 bar

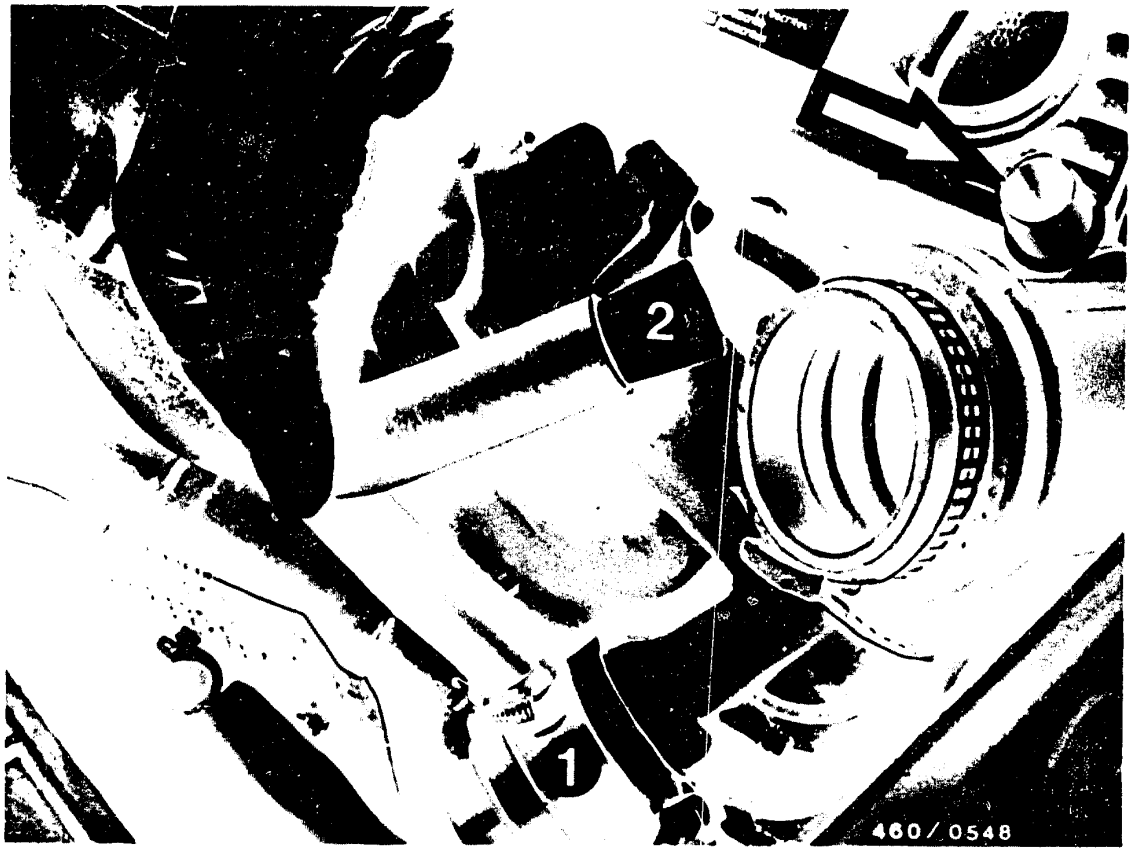
Note:

To assess the turbocharger, it is essential that the start of delivery and the nozzle-opening pressure are correctly set, that there are no leaks on the air-intake and exhaust sides, and that the engine is in good mechanical condition (valve clearance, compression pressure).



28.2.1 Charge-air pressure too high

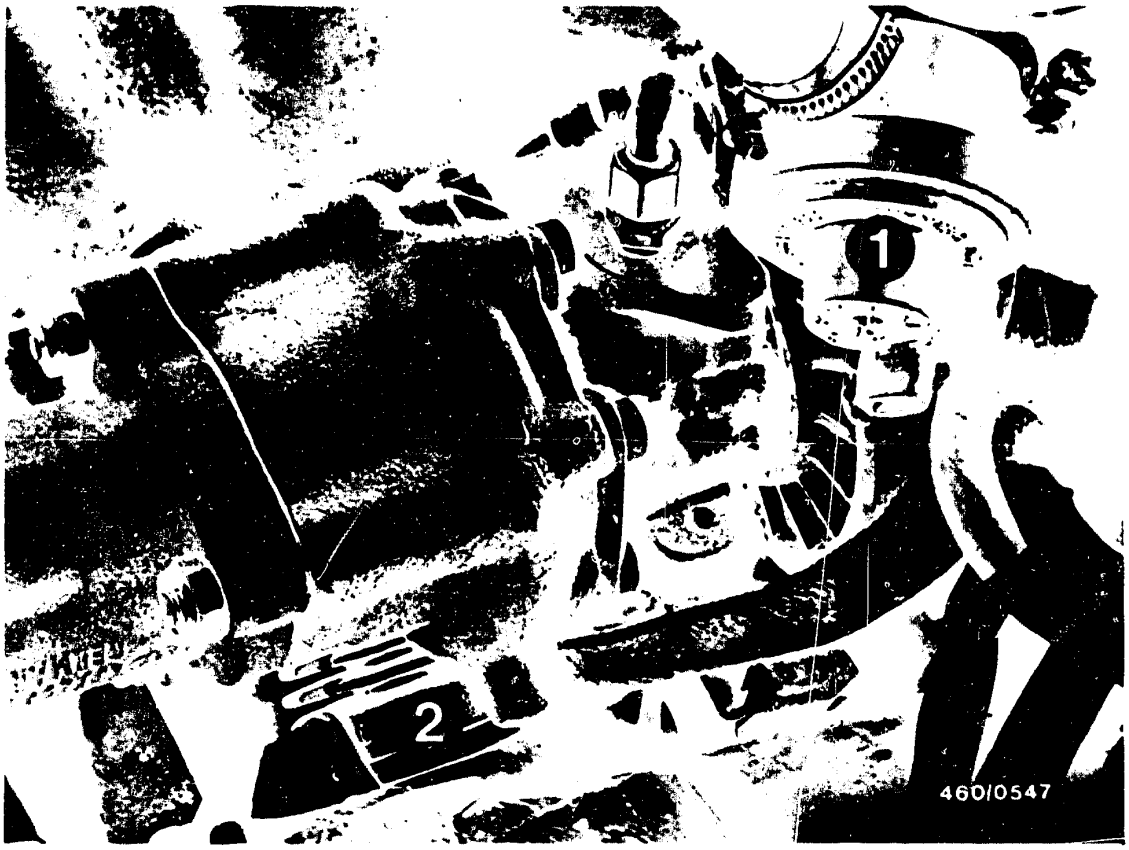
- Replace wastegate (2).



28.2.2 Charge-air pressure too low (test of blow-off valve)

- Remove hose from blow-off valve (1) at air-intake hose (arrow) and seal using suitable plug (2) (25 mm diameter, user-fabricated) and hose clamp.

- Repeat charge-air pressure test.



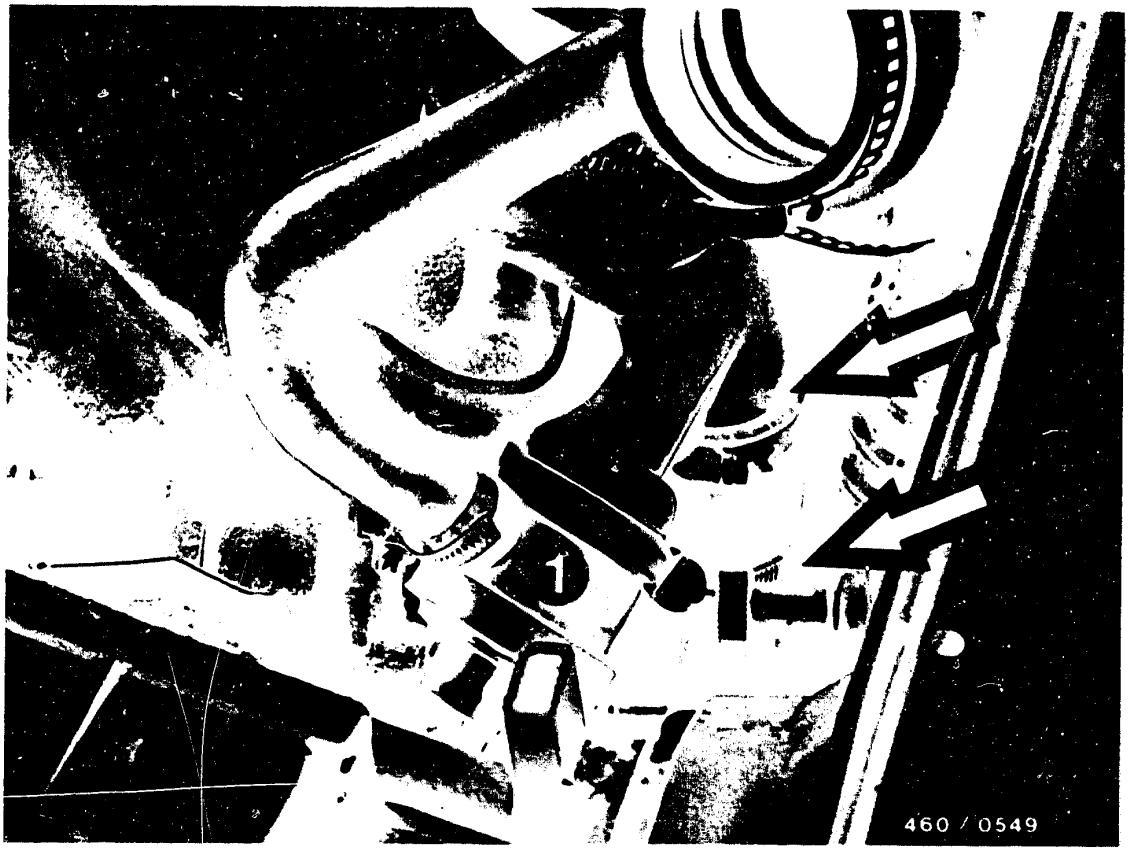
- Charge-air pressure 0.64 ... 0.72 bar
  = replace blow-off valve (1).

- Charge-air pressure still too low
  = try replacing the wastegate (2).

If then the set value is not obtained when retesting the charge-air pressure, replace the turbocharger.

Caution!

After installing a new turbocharger, let the engine idle for approx. 1 min. so that there is a guaranteed supply of oil to the turbocharger.



29. Test turbocharger for leaks

If the charge-air pressure is too low, test the following locations for leaks.

- Seal between charge-air tube and engine block.
- Connecting hose between charge-air tube and manifold-pressure compensator (injection pump).
- Leaking at blow-off valve (1).
- Connecting hose between compressor outlet and charge-air tube (arrows).
- Seal between wastegate and turbocharger.
- Seal between exhaust manifold and engine block.

After-sales Service

Motor Vehicle Service Information

AUDI 100 - 5 D — VDT-I-AUD 009 En

with VE..F..-distributor-type fuel-injection pump — 3.1979

The Audi 100 - 5 D is equipped with the VE..F..-distributor-type fuel-injection pump with mechanical governor, cold-start accelerator (KSB), temperature-dependent start quantity (TAS) and idle increase (TLA). Drive is by means of a separate drive wheel on the camshaft and toothed belt.

Engine data

Water-cooled 5-cylinder, 4-stroke Diesel engine with whirl chamber

Output 51 kW (70 DIN PS) at a rated speed of 4800 min^{-1}

Swept volume 2.0 l, firing sequence 1 - 2 - 4 - 5 - 3, compression 23:1.

Fuel-injection equipment

Original equipment (ex-factory)

(with VW-Audi trade mark and works-internal product number)

Distributor-type fuel-injection pump VE 5/10 F 2400 L 35
0 460 405 001

Trade equipment

(without VW-Audi trade mark, filled with oil as corrosion protection)

Distributor-type fuel-injection pump VE 5/10 F 2400 L 35 P
0 460 405 002

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

Fuel filter

Single-stage box-type filter FJ/DBR 1 W 6/3 0 450 133 009
with water chamber and drain screw
(Can only be obtained from VW representative)

Filter box

Bosch After-Sales Service can use the filter box 1 457 434 094 and the universal cover 1 455 523 009 with 3 inlets instead of a complete filter. The filter cover has 3 inlets (left, front, and right, with M 14 x 1.5 thread). 2 of the inlets are to be closed with screw plugs 2 911 271 701 and seal rings 2 916 710 609.

Nozzle-holder assembly

Nozzle-and-holder assembly	(Works model)	0 432 217 058
	(Trade model)	0 432 217 059

Comprising:

Nozzle-holder assembly	KCA 30 SD 27/4	0 430 211 041
Nozzle	DN 0 SD 193	0 434 250 063
Opening pressure	130^{+5} bar, gauge pressure	

See the microfiche for the complete Bosch equipment.

Notes on after-sales service

After-sales service will be carried out on these VE..F..-distributor-type fuel-injection pumps in the usual manner. The necessary technical documentation has already been published. A supplement will be issued for the test and repair instructions due to the special equipment "automatic KSB, temperature-dependent start quantity and idle increase".

All testing and repair work on the injection pump will only be carried out by Bosch service stations. The same arrangements apply as are already in force for the VW Rabbit (Golf) Diesel.

Tools for repair and testing

The normal tools, familiar from the VE..-injection pump are used. In addition, 3 extra tools are required:

Qty. 1	Mounting device (for assembly and disassembly of the control device	KDEP 1109
Qty. 1	Pin wrench (for loosening and tightening the threaded ring in the control device)	KDEP 1110
Qty. 1	Closing piece (for seal test of the control device)	KDEP 1111

Please order these tools from your local representative.

Exchange pump

The distributor-type fuel-injection pump 0 460 405 002 has been added to the exchange programme and allocated the Index 090.

Timing the pump to the engine

This pump is timed to the engine using the dial-indicator method.

Timing points

Injection pump:	At a plunger stroke of 0.85 mm after BDC
Engine:	TDC marking cyl. 1 on the flywheel.

Detailed fitting and removal instructions will be published with a Service Information.

Please take the necessary steps to ensure that your workshop performs rapid and faultless after-sales service on the fuel-injection equipment of these vehicles.

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